AGRICULTURAL *Chemicals*

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- Insecticides vs Wildlife
- Super Flo at Davison
- Pesticide Field Testing
- Cotton Pest Control
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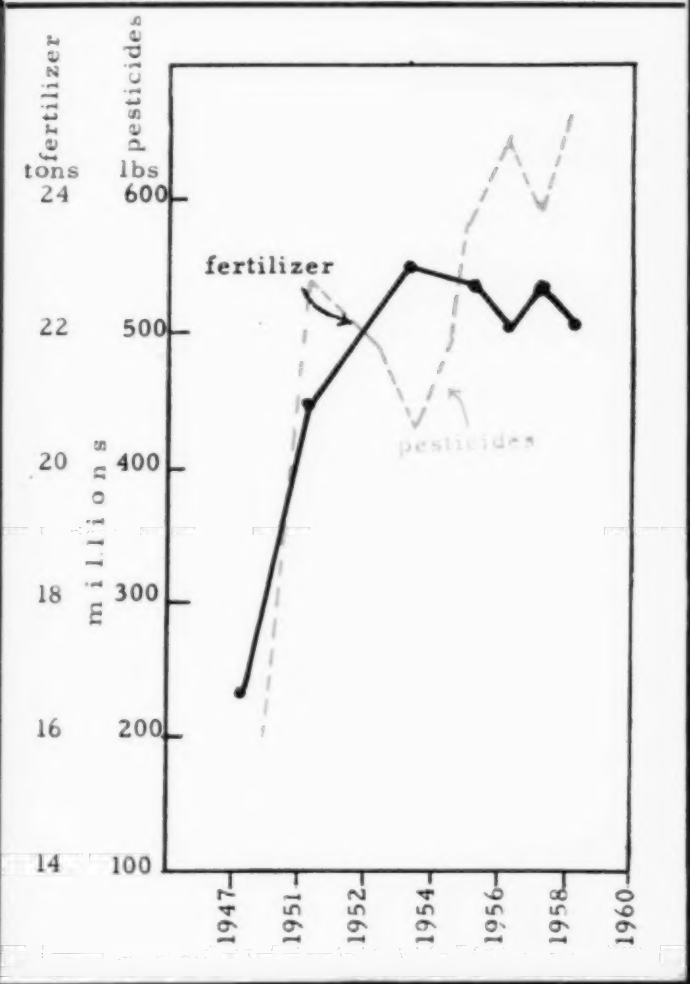
- Bactericide-Fungicide
- 4th Meeting for NPFI

JUNE, 1959



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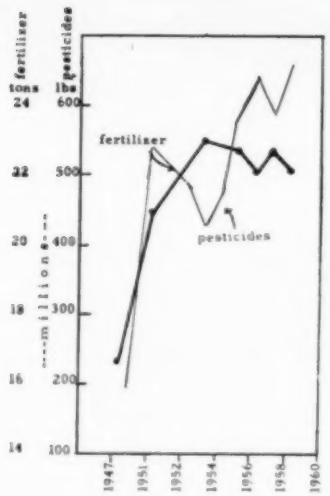

This Month's Cover

Early season demand for pesticides and fertilizers has been in larger volume than in 1958. The graph on our front cover this month charts fertilizer consumption and production of synthetic organic pesticides for the past ten years.

Vol. 14, No. 6 June, 1959

AGRICULTURAL *Chemicals*

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MEETING CALENDAR

June 9-10 — Seventeenth Annual Convention of the Association of Southern Feed and Fertilizer Control Officials, Velda Rose Motel, Hot Springs, Arkansas.

June 14-17—N. C. Branch, American Society of Agronomy, Kansas State Univ., Manhattan, Kans.

June 14-17 — National Plant Food Institute, Greenbrier Hotel, White Sulphur Springs, W. Va.

June 22-25—Agricultural Institute of Canada, Annual Meeting with cooperating societies, Winnipeg, Man.

June 27—Del-Mar-Va Peninsula Fertilizer Assn., Hotel George Washington, Ocean City, Md.

June 29-30 — Fertilizer Industry Conf., Univ. of Illinois, Urbana.

June 29-30 — California Fertilizer Conf., Univ. of California, Davis.

July 7-9 — Pacific Northwest Plant Food Assn., Regional Fertilizer Conference, at Tacoma, Wash.

July 15-17—Southwestern Fertilizer & Grade Meeting, Galver Hotel, Galveston, Tex.

July 29—Kentucky Fertilizer Conference, Guignil Theater, Uniference, Guignil Theatre, Univ. Kentucky, Lexington, Ky.

Aug. 9-13—Rocky Mountain Conf. of Entomologists, Cameron Pass 4-H Club Camp, Gould, Colo.

Aug. 18-22—California Fertilizer Assoc., Bigwin Inn Lake, Bays, Ont.

Sept. 20-24—Canadian Agricultural Chemical Assn., Chateau Frontenac, Quebec, Canada.

Oct. 13-14 — Western Agricultural Chemicals Assn., fall meeting, Villa Hotel, San Mateo, Calif.

Oct. 21-23—National Agricultural Chemicals Association, 26th Annual Meeting, French Lick-Sheraton Hotel, French Lick, Indiana.

Oct. 27-29—Florida State Horitcultural Society, Everglades Hotel, Miami, Fla.

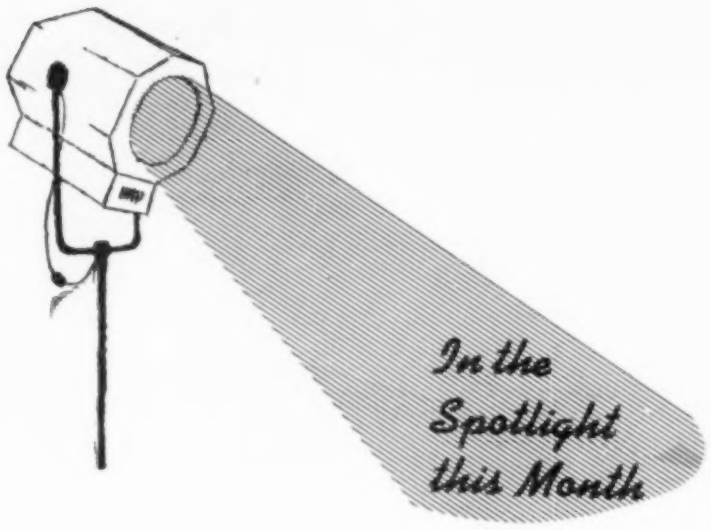
Nov. 4-6—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 9-11 — California Fertilizer Assn., 36th Annual Convention, Fairmont Hotel, San Francisco.

Nov. 16-20 — National Aviation Trades Assn., 20th Annual Convention, New Orleans, La.

Nov. 30-Dec. 2 — Soil & Crop Science Soc. of Florida, Gainesville, Fla.

Nov. 30-Dec. 3—Joint meeting of Entomological Society of Canada and Entomological Society of America, Detroit, Mich.



- **Steam in Granulation** . . . Low nitrogen grades of fertilizer can be granulated more economically by using steam in the process, than by adding sulfuric acid. Steam is of no benefit, however, in granulation of 1-1-1 ratio grades, or grades with 10% or more nitrogen. Page 51.

- **Bactericide-Fungicide** . . . Tests on a new organic plant bactericide-fungicide, show the product to be useful on celery, lettuce, cabbage and cucurbits. The product, Nabac 25, was introduced originally for use in protecting peppers and tomatoes against bacterial diseases. Page 53.

- **Fumes in Fertilizer Production** . . . Review of various types of filtering equipment for fertilizer plants, designed to remove dusts and fumes in fertilizer production. Page 38.

- **Cotton Pest Control** . . . A difference in ease of killing different aged weevils has been observed during different periods of the season. Nine-day old weevils are, for example harder to kill with BHC or Toxaphene than two-day old ones; boll-fed weevils are harder to kill than those that have fed on squares. Page 49.

- **Fertilizer Plants** . . . Illustrated stories on Sackett's "Super Flo" installation at Davison Chemical Co. in Baltimore; and Dorr-Oliver's installation for Anaconda Company's granular fertilizer plant in Montana are described on pages 46 and 37, respectively.

- **Pesticide Field Testing** . . . Thousands of new formulations are introduced each year. After many screening tests, the products must be proved by field testing before they are promoted commercially. Pesticide field testing services and techniques are reported in this article, by G. P. Townsend. Page 42.

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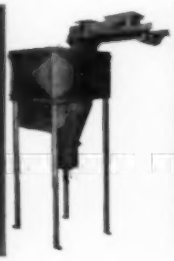

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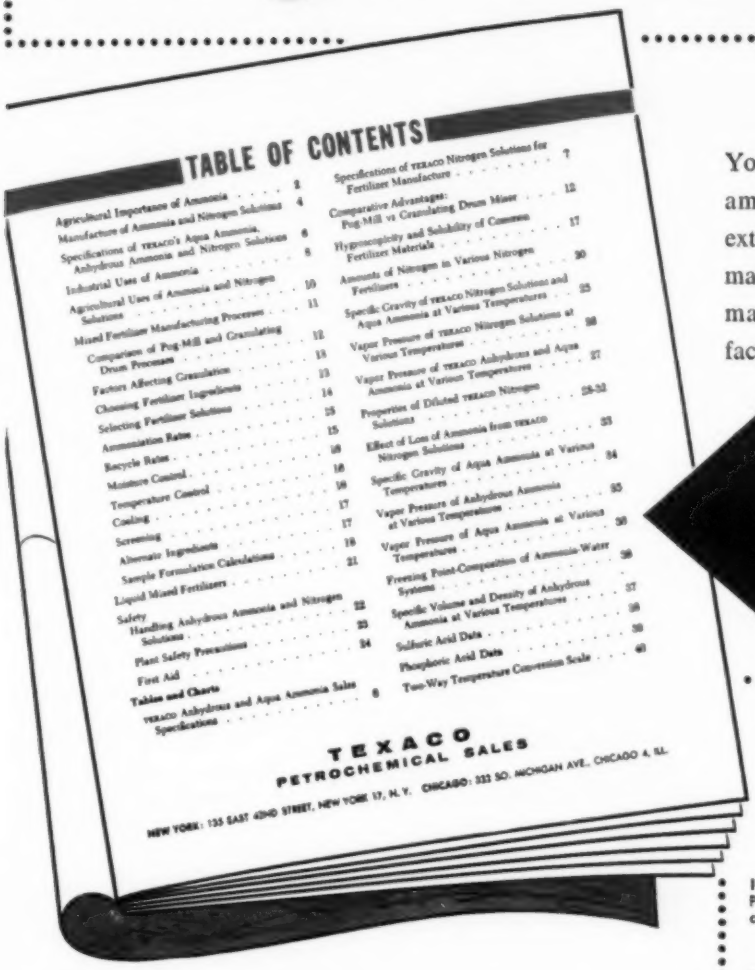

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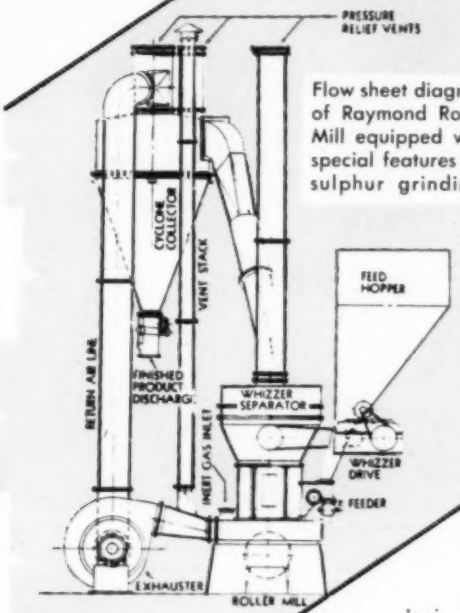

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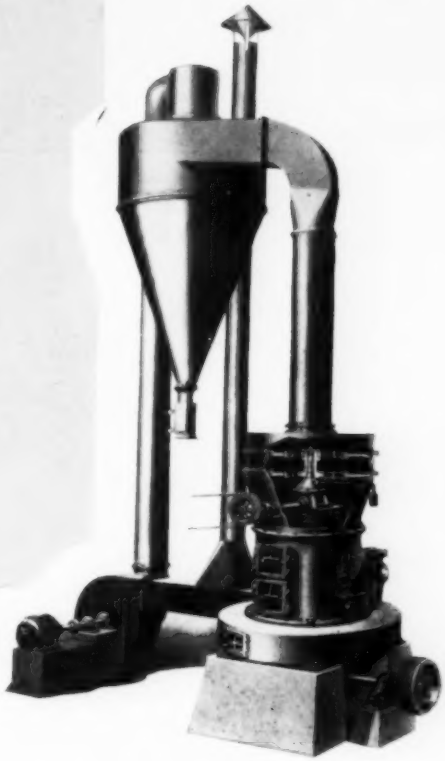

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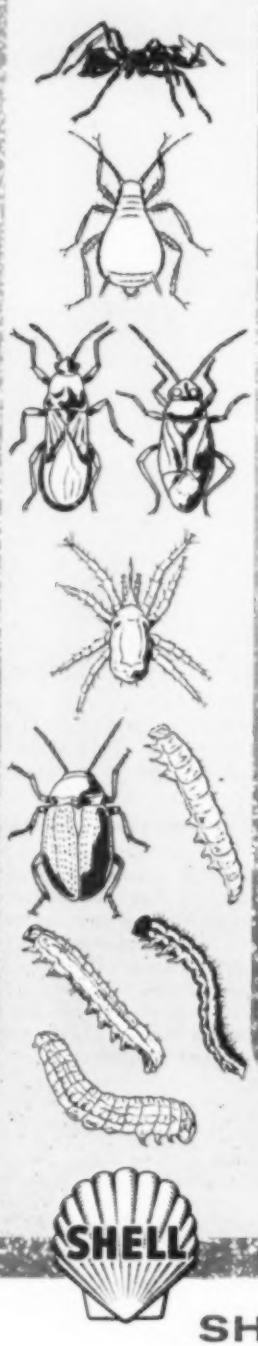

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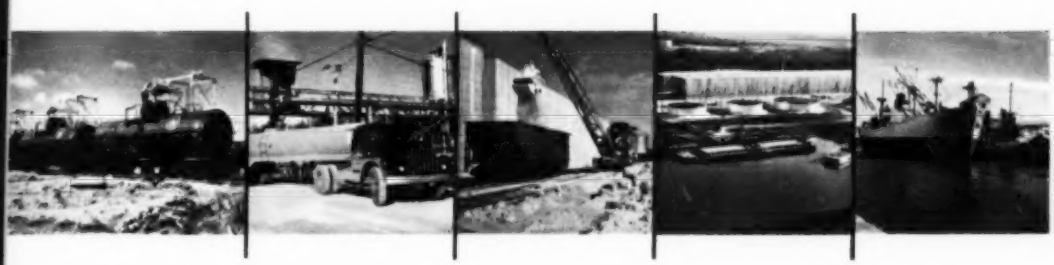

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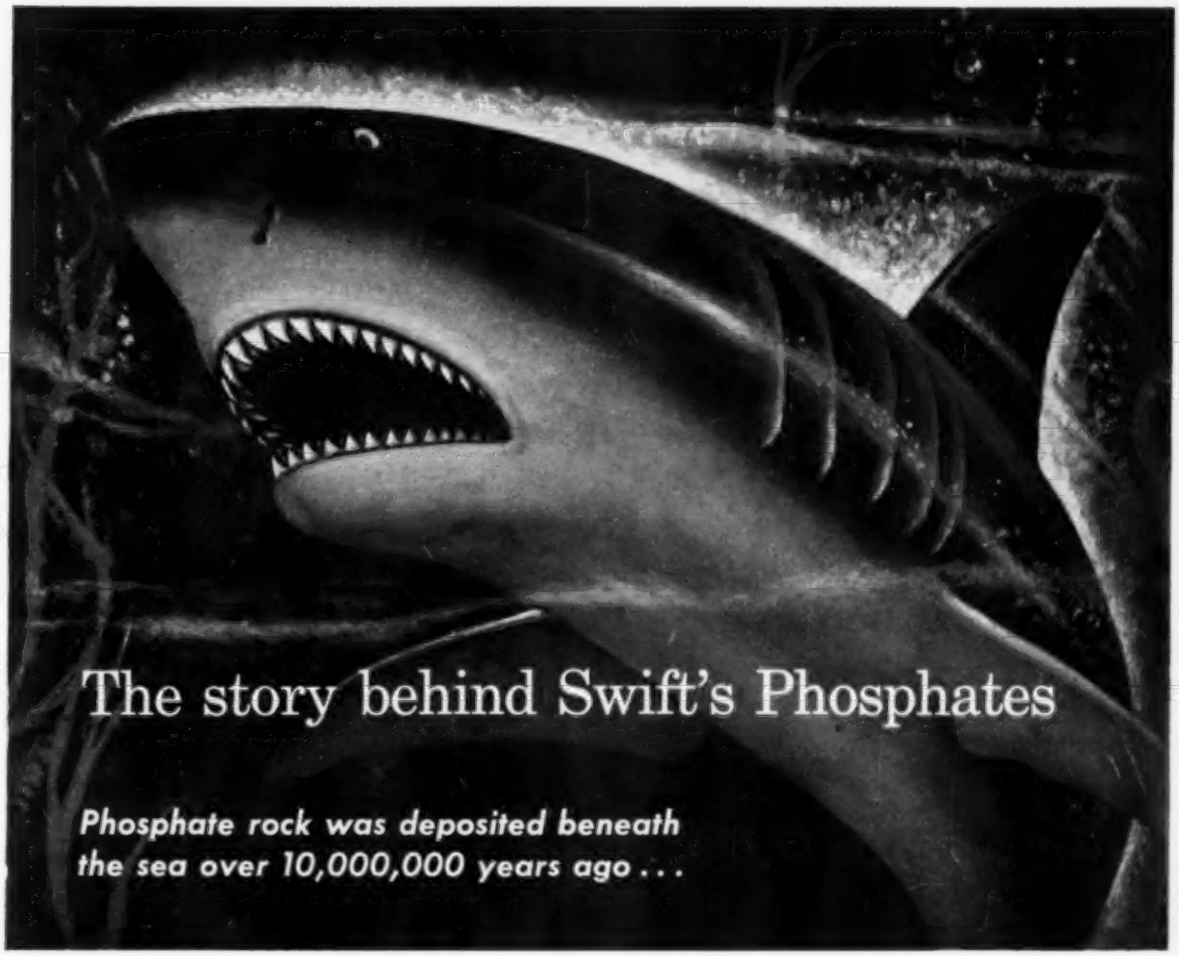

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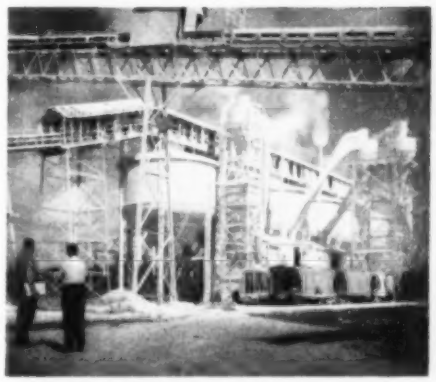

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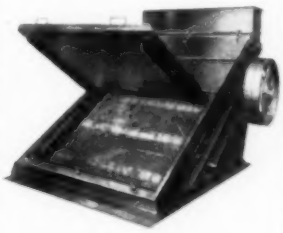

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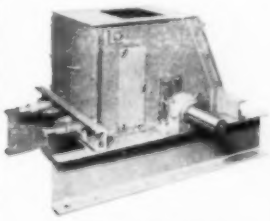

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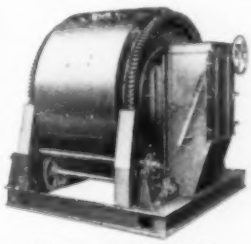

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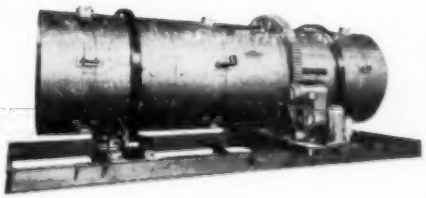

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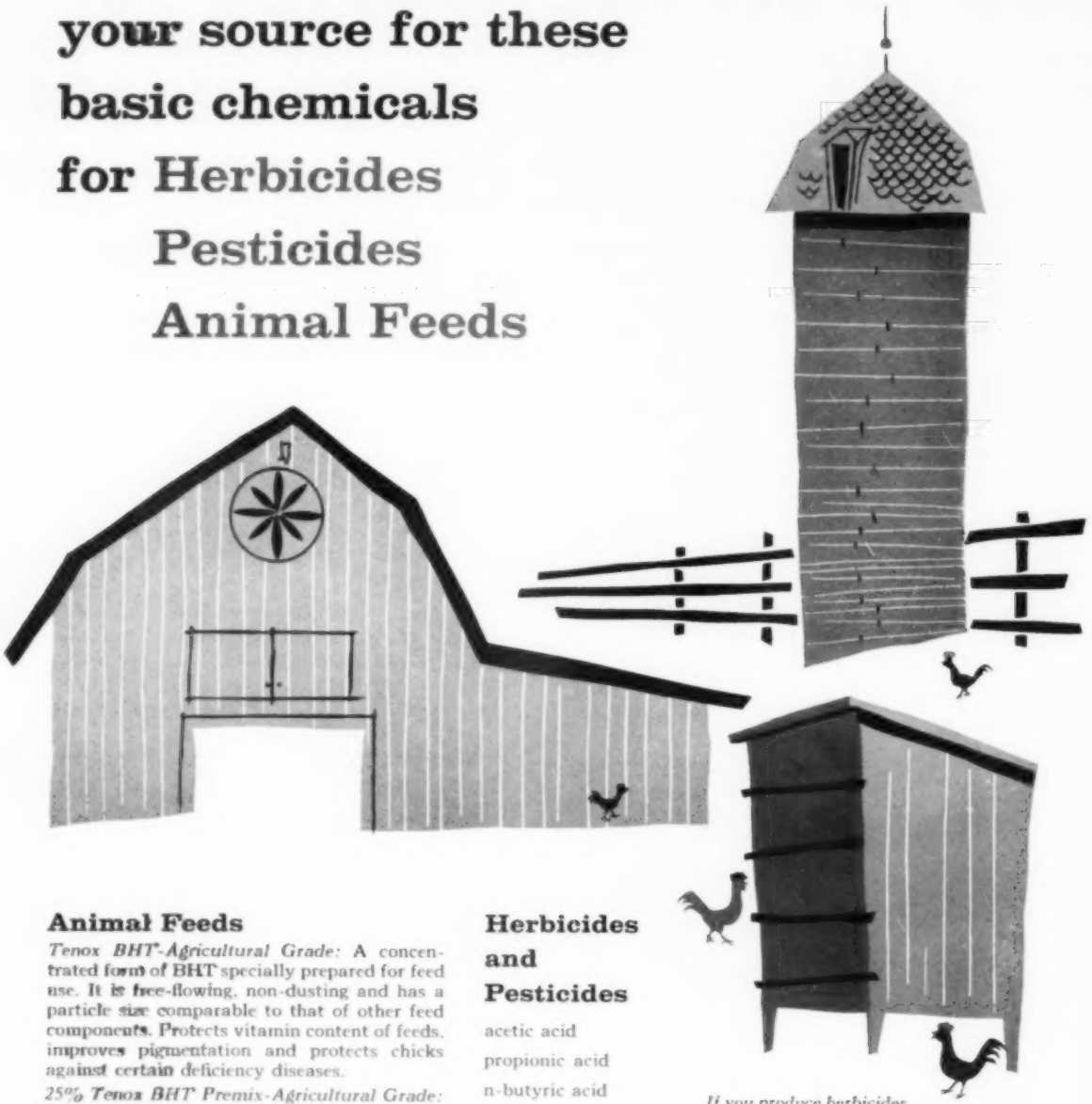

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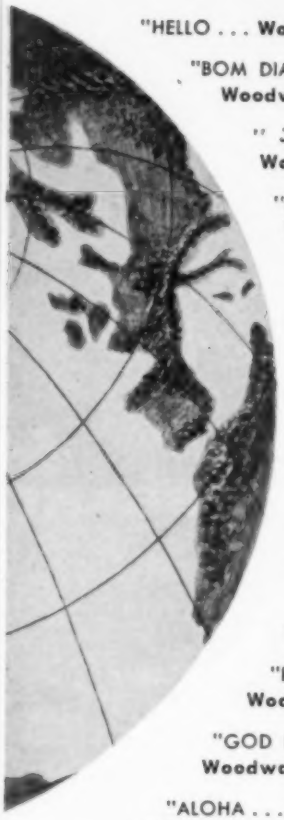

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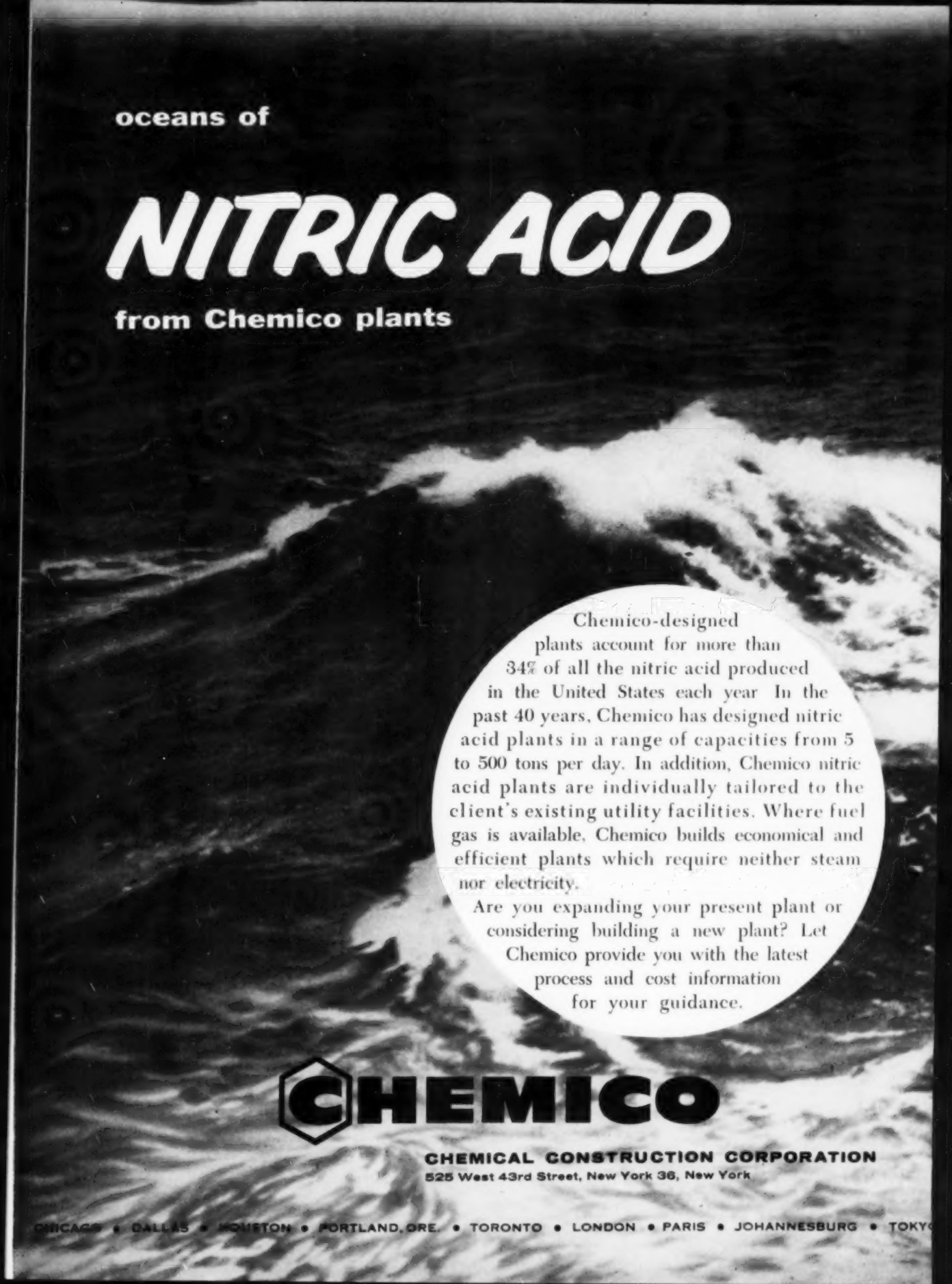
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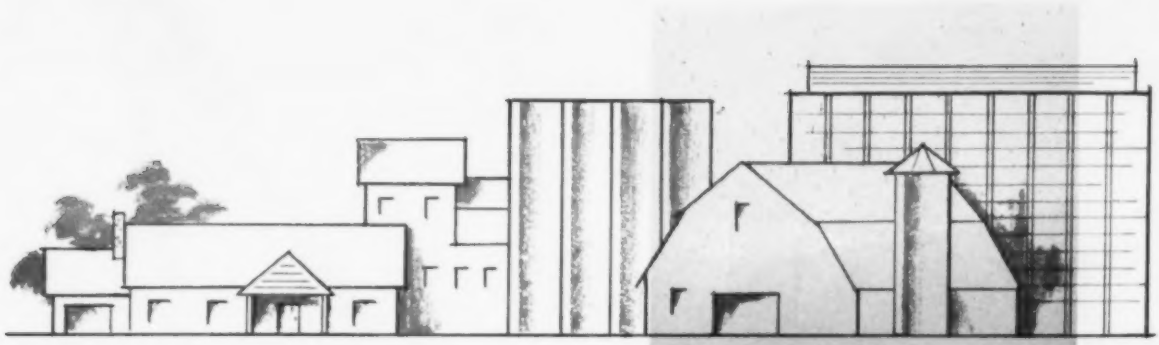

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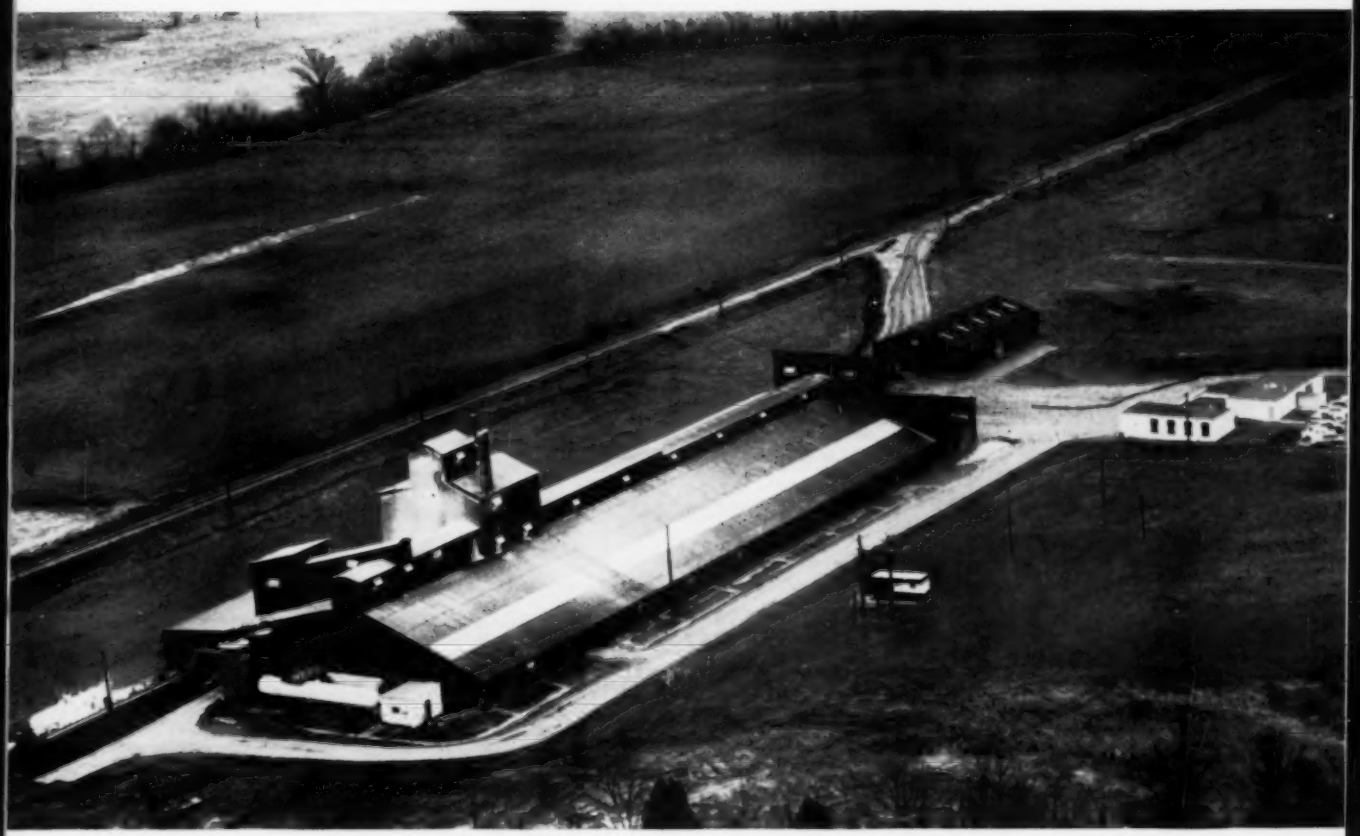

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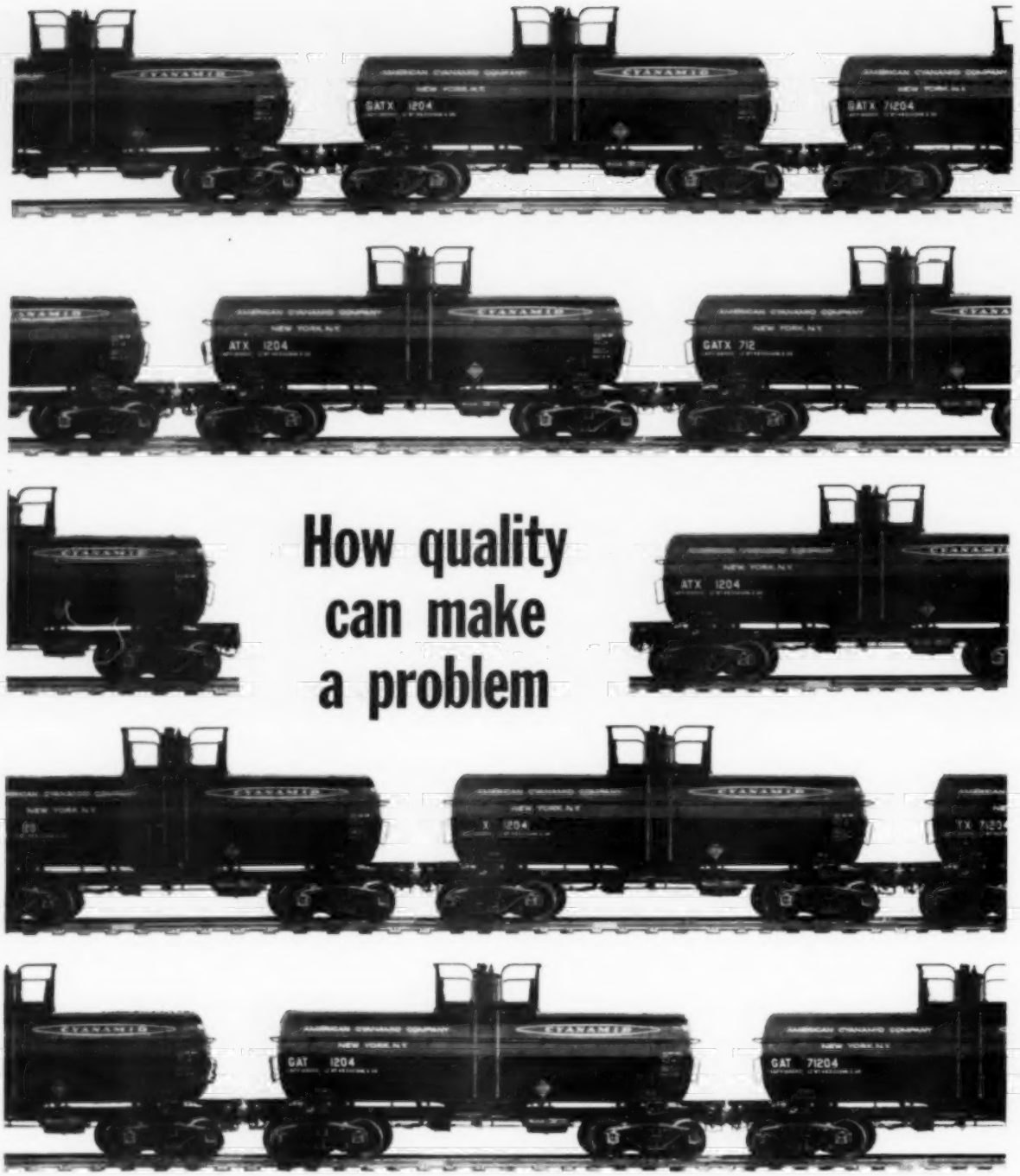

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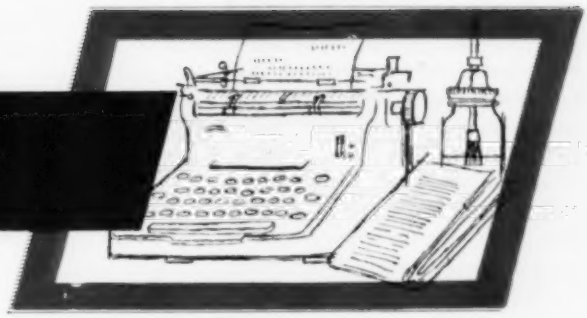
EDITORIALS



FROM early season indications manufacturers of agricultural insecticides can look forward this year to their biggest sales in history. As a matter of fact, at this stage a number of producers of basic toxicants report that they are unable to operate their facilities at a fast enough pace to keep up with demand. Early season ordering of pesticides has been almost phenomenal, with heavy demand coming from the mid-western corn belt, where one group of farmers at least seem finally to have been sold on the idea of preventive applications. Both heptachlor and aldrin are used for soil treatment. With corn acreage reduced this season, a high percentage of corn farmers will employ every chemical aid available to them to increase per-acre yields.

The campaign in the south to contain and control the imported fire ant has created another new market of major size. Here the products in heavy demand are heptachlor and dieldrin.

It is still a little early to judge just what can be expected from the cotton belt, but early season sale of pesticides was reported heavy And it is highly significant, we believe, that in spite of the tremendous consumption of insecticides on the cotton crop, still only 25 per cent of the acreage planted gets any treatment. There is a big further potential market yet to be tapped, and '59 could well see a major increase in pesticide use in the cotton belt.

A big foreign market has been building up for American pesticides over the past few years, and with the reduction in the previous heavy back log of existing pesticide stocks, buyers have been willing this season to anticipate some of their requirements, — obviously with the fear that later in the season they might not be able to count on prompt delivery. While on the subject of the expanding foreign market, it can be stated that last season Egypt took a tremendous tonnage of Toxaphene, and is continuing to buy at a substantial rate for '59 use.

In the east there is a growing demand for pesticides to control forage insects. Farmers well

(*Continued on Page* 122)

WE have commented before on the report that a Senate committee is preparing once more to investigate fertilizer prices (March, 1959. Pg. 27) We recommend that before they waste the taxpayers' money with what would in all probability be a pointless study, that each member of the Senate Committee of the Judiciary Subcommittee on Antitrust and Monopoly be required to read an excellent book on the fertilizer industry by Prof. Jesse W. Markham, reviewed elsewhere in this issue. (Pg. 95)

The author points out that the principal barrier to more effective competition in the fertilizer industry is a "highly imperfect knowledge underlying the demand for fertilizers" on the part of the farmer. Competition in this market cannot be fully effective, he emphasizes, as long as many farmers select high-cost over low-cost fertilizers on the basis of such irrational criteria as price per ton without regard to concentration, color, custom, etc.

The fertilizer industry has been pressed continually to manufacture and sell higher analysis mixtures, yet all too little has been done by government agencies to help convince the farmer that such concentrated products represent a more economical expenditure of his fertilizer dollar. A positive program of education in this direction would make much more sense than another pointless investigation of competitive conditions in an industry which is one of the most highly competitive in the entire country.

Are the Insecticides Insect Control

PESTICIDES, particularly insecticides, are currently being condemned by some organizations purportedly because of the damage caused to human health, crops, livestock, fish, and wildlife. As with any controversial issue, it is only fair to review both sides carefully, and to evaluate programs in terms of the greatest benefit to the public. There is an important need for administrators and scientists concerned primarily with research and pest-control programs, to get together more frequently with their associates, who are devoting their primary effort to protecting public health, fish, and other values to consider these problems and proper courses of action. Even though the subject matter is broad and complex and involves several interests, continued progress will be made by considering factual information in an atmosphere of frank and unemotional discussions.

All of us are responsible for encouraging the intelligent use of land and water. From the viewpoint of public health and fish and wildlife resources, serious water pollution may result from (1) the shift in land usage, including the change from hilly land most suited for pastures and forests to cultivation causing consequent siltation in streams; (2) industrialization which may contaminate streams through improper treatment of chemicals before discharge; (3) silt and washings from mining operations; (4) discharge of radioactive wastes; and (5) expanded urbanization with attendant problems of disposal of raw sewage and household detergents. Some of these changes have had a drastic effect on wildlife habitats. They have been going on for a long time and are inherently a part of civilization. Hence it becomes nonsensical to talk about maintaining a complete balance of nature, because through man's activities these disruptions are becoming increasingly more the rule. Nevertheless, we should do what we can to keep these undesirable changes to a minimum.

Actually, of course, natural habitats are subjected continuously to major upsets. Lately the widespread use of insecticides has come in for some criticism as a water pollutant, and it is timely to review this matter, since all of us have an abiding interest in clear and clean waters, and in the preservation and harvest of fish and wildlife depending on the species. Entomologists, in response to grower and public demand, have the responsibility for developing and recommending ways to control destructive insects. The most feasible approach for dealing with insect problems has been the use of insecticides. The problem immediately resolves itself in the selection of insecticides that are the most effective against destructive insects and at the same time the least hazardous to other organisms.

For several years I had an opportunity to study the side effects of applications of DDT over forests on both terrestrial and aquatic insect populations. It was soon determined that at the dosage used the greatest potential hazard was to aquatic organisms, and accordingly, studies were intensified on streams and lakes. In this paper I plan to review the studies made on the effects of insecticides on aquatic life in the United States, since Rudd and Genelly (1956) published their bulletin entitled "Pesticides: Their Use and Toxicity in Relation to Wildlife."

Incidentally, these authors arrived at the general conclusion that pesticides were less harmful to fish and wildlife than were changes brought about by land and water development and use. Their bulletin revealed that few extensive experimental studies have been made to determine the effects of various insecticides on stream fauna. The few recorded losses to fish and aquatic birds were associated largely with the misuse of insecticides, such as cleaning of spray equipment in ponds or streams or their use on an emergency basis. Such was the record up to 1955 in relation to the treatment of millions of acres of crops, forests and swamps that had been sprayed successfully during a 10-year period to control serious pests without permanent damage to fish and wildlife resources. Later in this paper are summarized the results of research investigations and reports of damage to aquatic life, resulting from insecticide applications since 1955.

Benefits of Insect Control

BEFORE considering the potential hazards of insecticides to aquatic life; it seems appropriate to review the need for con-

Part 1

Required for Hazardous to Aquatic Life?

By C. H. Hoffman*
Entomology Research Division
U. S. Department of Agriculture
Agricultural Research Service

trol materials. It is easy to forget that insects are probably man's greatest challenge to supremacy on earth. It is estimated that in the United States 10,000 species are injurious, and in spite of many effective control measures, they cause loss of approximately $4,000,000,000 annually. If control measures were not available, the annual losses would exceed this figure by several times. In fact, many crops could not be grown economically, and our standards of health and economy would suffer serious setbacks. Insects are, therefore, of great economic importance and have a direct or indirect effect on each citizen. Entomologists welcomed the availability of DDT in 1942 for the control of insect-born diseases threatening military and civilian lives, which historically have been greater killers of man than the instruments of war. Knipling (1953) estimated that during the first 10 years of use, 5 million lives were saved and 100 million illnesses prevented through the use of DDT for controlling such diseases as malaria, typhus, and dysentery. The World Health Organization states that in at least 120 of about 200 countries and territories of the world malaria acts as a drag on economic development. Largely through the use of modern insecticides for mosquito control, progress is being made to eradicate malaria on a world basis.

Following the war, DDT and other chlorinated hydrocarbon insecticides became available for civilian use. Within a few years, outstanding control was obtained against insects that damage or destroy fruits, vegetables, tobacco, sugar beets, sugarcane, cereals, cotton, pastures, ornamentals, and livestock. Soon the yields of many crops jumped 10 to 20 per cent or more, and crops were of higher quality. Moreover, some of these new materials were effective against insects that carry destructive diseases of plants, livestock, and man. Crop losses caused by many pests were reduced drastically. This is the background that led to the great dependence being placed on the use of insecticides. They have become a way of life, and most assuredly will be recommended and used until such time as other control measures are developed. The insecticide recommendations of the Entomology Research Division (1959) for the control of insects attacking crops and livestock are given in a 129-page handbook, which also includes a discussion of precautions, including safeguards in relation to fish and wildlife and individual safety restrictions to protect spray applicators, and also restrictions on the timing of applications in reference to harvest in order to meet tolerances established by health officials.

Forest insects, the greatest single hazard to forest crops, are estimated by the Forest Service to be responsible for 40 per cent of all the losses of saw timber and 28 per cent of those of growing stock. Forests must be protected from insects if we are to have (1) lumber and other wood products; (2) clean water for irrigation and hydroelectric power and to fill industrial and domestic water needs; (3) meadows and grasslands for the grazing of domestic livestock and wildlife; (4) suitable habitats for fish and wildlife sought by hunters; and (5) scenic areas for camping, vacationing, and recreation. Until DDT was found to be effective against defoliating forest insects when dispersed by airplane over vast and inaccessible areas, it was not possible to protect these values. Since 1945, approximately 19 million acres of forest land in the United States have been sprayed with DDT. Those so concerned over the temporary and minor effects on fish and wildlife and their food organisms might well pause and reflect on the real damage that occurs to wildlife habitats when insect epidemics run their devastating course, which is usually followed by fire and consequent losses of timber, habitat, fish, and wildlife.

Expanded Use of Insecticides

THE outstanding benefits obtained through the judicious use of insecticides lead to the de-

*Presented before the Second Seminar on Biological Problems in Water Pollution, Cincinnati, Ohio, April 21, 1959.

velopment of new materials and an overall increase in the quantities used. You are doubtless familiar with the high grade standards maintained in this country with respect to food. The food producer must come up with products that are free not only of insect damage or contamination, but also of undesirable pesticide residues. Frequently, the margin of safety in either direction is very narrow. As long as we have the free enterprise system in this country, farmers and other producers will seek and use all methods of modern technology available for efficient production. If the farmer is to remain in business, he cannot tolerate insect losses to his crops.

The American public also expects complete protection from debilitating or deadly diseases, many of which are transmitted by insects, mites, and ticks. Moreover, since it has more leisure time to spend in recreational areas, there is a demand for control of such pests as mosquitoes, biting flies, ticks, chiggers, and caterpillars dropping on webs from trees. Therefore, many control programs are undertaken each year, because of insects causing economic damage or becoming a nuisance.

In the United States, the production of inorganic pesticides has remained fairly constant in recent years—about 450 million pounds annually, nearly two-thirds of which is ground sulfur. The production of synthetic organic chemicals has increased steadily, and in 1956 amounted to 569,927,000 pounds valued at the producer level at $274,894,750 (Shepard 1958). In 1955, it was estimated that pesticide costs averaged about $60 per farm. There has been a growing use of airplanes to disperse chemicals. In 1956, approximately 38,667,000 acres of crops, forests, and other land were treated from the air for control of insects. In 1957, the production of some major insecticides was about as follows (in pounds): aldrin, chlordane, dieldrin, endrin, heptachlor, and toxaphene (combined) 75,000,000; BHC exclusive of lindane 46,000,000; calcium arsenate 20,000,000; DDT 124,000,000; and lead arsenate 13,000,000.

According to Metcalf (1959), there are approximately 40 organic-phosphorus pesticides in commercial or semicommercial use on a world-wide basis. His estimates of world production having an annual value of $50,000,000 are as follows (in pounds): parathion and methyl parathion 20,000,000, malathion 10,000,000, Diazinon 1,000,000, Trithion 1,000,000, Guthion 1,000,000, Systox and Meta-Systox 500,000, TEPP 400,000, Phosdrin 250,000, Schradan 100,000, and Thimet 100,000.

These figures on insecticide production serve to point out those materials that are being used most widely. There is no question but that large quantities of insecticides will continue to be used. As some fail, because certain insects become resistant to them or for other reasons, new ones will become available. Increasing interest is being shown in nonchemical methods of insect control, involving biological control agents, plant varieties resistant to insect attack, and other methods. There is reason to believe that with adequate research support, such methods can be developed that will solve many of our major pest problems, and thus avoid many of the hazards. To be realistic, however, we must recognize that insecticides will be needed to meet insect problems for many years to come. It is essential, therefore, that major emphasis be given to research on the development of chemicals and methods for their use, that will provide satisfactory control with minimum hazard to other organisms. Through cooperative studies by specialists of various disciplines, I personally feel confident that great progress can be made in solving the many complex problems associated with the use of insecticides and their hazards to fish and wildlife, and that sound recommendations can be made that will be satisfactory to all, as was done in the cooperative studies on DDT.

Effects of Insecticides on Aquatic Life

MUCH publicity has been given to a substantial fish kill several months after the spraying in 1955 of forest land near the Yellowstone River in Montana.

Because there was no evident cause, this mortality was attributed by some to DDT spraying at the rate of one pound per acre for control of the spruce budworm. Because there was no mortality of fish at the time of spraying (Parker 1956), and of the distance of the forest from parts of the river, it is hardly conceivable that DDT could have been the cause of such delayed mortality of large fish (Hoffman 1958, Hoffman and Drooz 1953, Cape and Springer 1958).

Cooperative studies made on 13 smaller streams in this area in 1956 by the U. S. Forest Service, the U. S. Fish and Wildlife Service, and the Montana Fish and Game Department (Graham and Scott 1958) confirmed previous findings in the East that aquatic insects were reduced materially by the DDT spray dispersed at one pound per acre. Most of the trout gorged on insects killed by the spray but did not succumb, there was a gradual repopulation of aquatic insects during the four months after spraying, and no indication of leaching of DDT into one stream after a 1.2-inch rainfall. Other findings of note were: (1) numerous yearling brook trout collected in one stream a year after treatment showed survival of young-of-the-year fish (2) live brook trout captured 16 months after spraying were found to contain DDT; and (3) trout in a sprayed stream where the bottom fauna was depleted fed on terrestrial insects and midge fly larva. In 11 of these streams, in which maximum damage would be anticipated, there was no delayed fish mortality, but

(Continued on Page 111)

ammonium phosphate and triple superphosphate

PRODUCTION at ANACONDA COMPANY

ANACONDA Company's granular fertilizer plant at Anaconda, Montana was designed by Dorr-Oliver Incorporated to produce 250 tons of ammonium phosphate, or 160 tons of triple superphosphate per day, utilizing the Dorrco Granular Ammonium Phosphate Process and the Dorrco Triple Superphosphate Process, respectively.

When producing ammonium phosphate, a mixture of a phosphoric acid-gypsum slurry and phosphoric and sulfuric acids is neutralized with anhydrous ammonia. Gaseous ammonia reacts to form a mixture of monoammonium phosphate, ammonium sulfate and gypsum. The resulting slurry is mixed with a large quantity of recirculated granules and then dried. A sized fraction is screened out and the remainder recirculated to process.

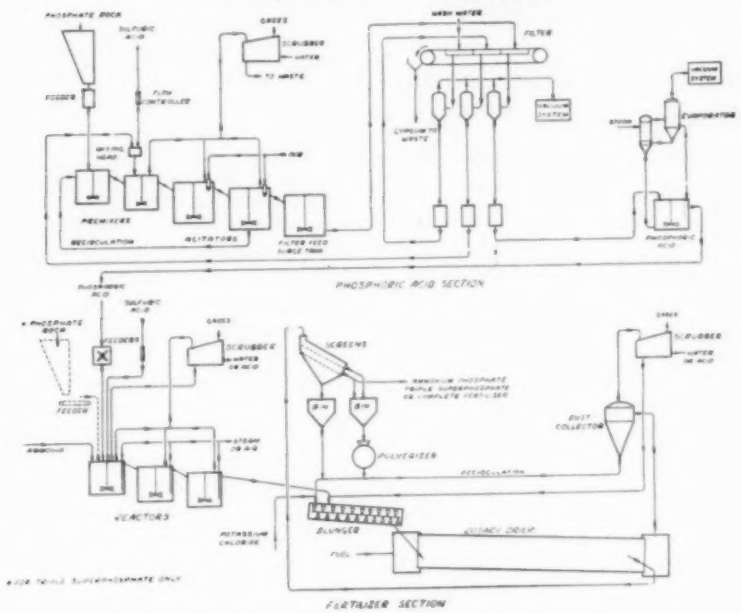
Manufacture of triple superphosphate is very much the same, except that phosphate rock dust and evaporated phosphoric acid are the raw materials. The mixture of these two components produces the desired triple superphosphate slurry, which is then mixed, dried and screened.

In the production of either type of fertilizer, the raw materials are fed to the reaction system, consisting of three mechanically agitated saturators in series. Steam and air connection to each tank provide temperature control. The gases liberated from the saturators are exhausted to atmosphere by a fan and stack. This equipment constitutes the wet end of the system.

The dry system starts when slurry produced from the wet system overflows to a blunger. Here it is mixed with fines, cyclone dust and ground oversize from the circulating system before being fed to a gas fired, direct heat, rotary drier. The dried material is discharged through a grizzly, and the exhaust gas is drawn through a cyclone dust collector and discharged to the atmosphere through Doyle scrubbers. Cyclone dust is returned to the blunger via a fines conveyor. Oversize from the grizzly is manually handled for grinding in a reclaim crusher.

(*Continued on Page* 113)

Flow diagram at Anaconda Company



9' x 70' phosphate rock dryer including "grizzly" design at left end.

Reducing Fumes by Filtration

Operation and Performance of Filter Equipment at Fertilizer Plants of the Indiana Farm Bureau Cooperative Association, Inc.

THE Hydro-filter is a cone-bottomed steel housing containing two packed beds above the contaminated gas inlet. The lower bed (filter bed) has a 3" to 4" layer of glass marbles, and the upper bed (demist bed) has a 6" layer of Berl saddles. Large orifice, low pressure spray nozzles impinge water onto the bottom of the filter bed and the top of the demist bed —these sprays operate respectively at 20-25 lbs. and 5-7 lbs. Pressure drop is 5" to 6" water gauge.

Operation:

The dust carrying gas stream expands into the lower part of the housing, then flows upward through the marbles at high velocity (4000 to 6000 feet per minute). Water from the sprays is carried thru the marbles to form a violent turbulent layer (4" to 8" deep) above the top marble layer. Collection of dust is by:

- Condensation effect on entry of gas into scrubber—this causes some agglomeration of small particles.
- High velocity impingement of dusts onto marble surfaces.
- Impingement on bubble surfaces and containment within bubbles.
- Impingement on water droplets.

The turbulent water layer is continuously replenished by water drawn up thru the bed; therefore, since the air column can support only so much water head, the excess water (which contains dusts and absorbed gases) continuously flows back thru the bed. This backflow is at a continuous rate but for any specific area of the bed it is an intermittent backflow. The back flow washes dusts and slimes off the marbles to prevent blinding of the bed.

The dirty water contains both solubles and insolubles and drains from the cone bottom to a tank from which it is recirculated back to the filter bed sprays at a rate of 3 gpm per 100 CFM scrubber capacity.

Water droplets picked up by the gas stream in the turbulent layer are removed by the saddle bed —rapidly changing air direction throws out the water drops and these drop down to the turbulent layer.

A timer and solenoid valve are furnished to wash this bed with fresh water for 30 seconds each 15 minutes. These upper sprays operate at 5 to 7 lbs. Pressure creates large water drops to prevent re-entrainment. This wash water is fresh water make-up to the recirculating system to replenish evaporation loss—it amounts to approximately 1/7 gpm per 1000 CFM capacity of scrubber. These scrubbers can handle dust loads up to 40 grains per cu. ft. Water recirculation, of course, is increased to keep lower bed cleaned.

*This report on the operation and performance characteristics of filtering equipment for fertilizer plants was discussed by L. M. Leach, production manager at the Indiana Farm Bureau Coop Assn., Inc., Indianapolis, Ind., at the Fertilizer Industry Round Table Meeting, November 5-7, 1958, in Wash., D. C.

Performance:

When the Hydro-filter was under consideration for scrubbing dryer gases, there was no specific data available regarding its performance in the fertilizer industry. Ammonium chloride fumes, which were known to be a major problem in fertilizer production, are usually less than 1 micron in size. The Hydro-Filter was known to have 100% collection efficiency on dusts 2 microns or larger, and tests on the following types of fume and dusts showed:

Item	Efficiency
Lime Kiln	99+% insolubles: Ca, etc. 92% solubles; Na, etc.
Electric steel furnace	77% fume known to range .05 to .5 micron

A 2000 CFM test unit was tapped into the stack beyond the cyclones to measure solids being discharged from the stack and determine Hydro-filter efficiency. Tests were made on 5-20-20 and conducted by manufacturer's personnel with quantitative weights of filters made by the plant's contract chemist. Filters used were an absolute glass type which are guaranteed to catch particles 0.2 micron or larger (cigarette smoke).

Inlet gas temperatures were 200-220° F. and outlet temperatures from the Hydro-filter were 100-120° F. when using fresh water for scrubbing.

Ammonium chloride appeared on the outlet filters but none was on the inlet filters; this indicated the chloride entered the scrubber in gaseous phase but was sublimed or condensed before hitting the outlet filter. No quantitative measurements were made to determine efficiency of chloride collection, because this type of fume in gaseous phase is beyond the range of low pressure loss scrubbers.

The series of tests on 5-20-20 showed an overall efficiency of 95% for removal of dusts leaving the cyclones and was considered conservative due to absence of any chloride measurement on the inlet side.

A 30,000 CFM unit was purchased for the Indianapolis dryer which operates at 30-40 tons per

hour. Tests on 5-20-20 production showed:

Inlet Loading Grains per Std. cu. ft.	Outlet Loading Grains per Std. cu. ft.	Efficiency
1.542	.0556	96.4
1.000	.0514	94.9
.874	.0254	97.1
1.015	.0255	97.5

If the normal cyclone emission is 1 grain per std. cu. ft. then approximately 260 lbs. dust are being thrown out the stack each hour.

For Example:

$$\frac{30{,}000 \text{ cu. ft.}}{\text{Minute}} \times \frac{60 \text{ min.}}{\text{Hr.}} \times \frac{1 \text{ gr. dust}}{1 \text{ cu. ft. air}} \times \frac{1 \text{ lb.}}{7000 \text{ gr.}} = 257 \text{ lbs./hour.}$$

Applying the 95% removal efficiency of the scrubber, dryer emissions would be reduced to approximately 13 lbs. per hour. This type of emission is composed of such small particles that no fallout will occur near the plant—rather they will be dispersed by wind action over such an area as to be unnoticed.

At that plant the stack has a vapor plume which disappears rapidly.

It seems the difference in the plumes of the two plants is due to inlet gas temperatures—at Indianapolis the temperature is high [180-220° F.] while at Jeffersonville it is only 130-150° F. due to blending of gases from mixer, dryer and cooler. The lower inlet temperature may induce a formation of solid chloride, since the gas is below the sublimation or gaseous phase temperature; if this is true, removal efficiency would be higher as evidenced by stack appearance.

Characteristics of various types of dust control equipment

Type	Advantages	Disadvantages
Cyclones	Low cost, low pressure drop (2″), can return dust to system, low maintenance	Cannot collect below 10-15 microns.
Wet Scrubbers (low pressure drop 4″-6″)	Can be used in series with cyclones, moderate cost, solids can be returned to system. Collection to 2 to 5 micron range.	Vapor plume. Condensation of moisture in stack during cold weather. Some fume gets thru if inlet temperatures high. High cost of operation—power.
Wet Scrubbers (15″-30″ drop)	High efficiency on fumes same advantages as for low pressure wet scrubbers	High water consumption and high pressure nozzles. Vapor plume. Condensation in stack.
Dry Bag	High efficiency Moderate pressure loss, same advantages as low pressure scrubbers.	High initial cost Difficulty in disposal of fine, dry dusts. Temperature control desirable to protect bags. Possibility of mudding in bags with wet gases. Corrosion.
Electro-Static	High efficiency Low pressure drop—2″	High cost Disposal of fine, dry dusts Corrosion.

General:

At both plants the recirculated water to the scrubbers picks up soluble and insoluble compounds. This solution is bled off the pump line and goes to the ammoniator for control of granulation. Therefore the collected dusts are retained in the system and not thrown away. At our Jeffersonville plant, on a run of 26,000 tons, we have cleaned our sludge tanks just four times, — and this included one cleaning during the summer to check the condition of the tank. The situation is quite similar at our Indianapolis plant. At this location, however, we have the extra water coming to the sludge tank from the Peabody ammoniator scrubber, the RotoClone cooler and the air compressor after cooler water.

Recirculating pump at Jeffersonville is ordinary cast iron and has given good service for approximately 26,000 tons fertilizer production in spite of the solids and corrosive type solutions handled.

Installation Cost:

The installation expense varies considerably depending on local conditions. It is interesting to note that the cost of complete installation (except Hydro-filter) was approximately $10,000 at one plant and $18,000 at another.

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Hydrogen Phosphide Fumigant

Hydrogen phosphide evolved from aluminum phosphide has been used for the fumigation of stored grain in Germany for many years. Experimental data indicate that hydrogen phosphide (Phostoxin), is effective as a fumigant against *Tribolium confusum* Duv. *Sitophilus granarius* (L.), *S. Oryza* (L.), *Trogoderma granarium* Everts, *Rhyzopertha dominica* (F.), and *Oryzaephilus surinamensis* (L.), and readily penetrates flour or wheat. No effect on seed germination has been observed, and preliminary results indicate no effect on baking quality. D. L. Lindgren, L. E. Vincent and R. G. Strong. *Journal of Economic Entomology*, December, 1958.

Note: The following review reports on "Official Tolerances and Clearances for Pyrethrins and Piperonyl Butoxide in the U.S.A." The review is a condensation of an article by Walter E. Dove, Fairfield Chemicals, Food Machinery and Chemical Corp., Baltimore, which appeared in the October, 1958 issue of *Pyrethrum Post*. The article describes the work on pyrethrins in preparation for application of an official tolerance.

re: use in the USA of

Pyrethrins *and* Piperonyl Butoxide

Residues for Other Commodities

THE reported safety of pyrethrins was more fully understood when early beliefs were confirmed in acute and chronic feeding studies by Dr. A. J. Lehman.*

He found that the acute LD/50 for pyrethrins in rats was 200 mg./kg., also that rats in chronic feeding tests and consuming 1000 ppm of pyrethrins in all their food, tolerated these amounts without any gross effects of injury to the animals. The lowest dietary level with gross effects on rats was 500 ppm, and this was the lowest level to show any damage of tissues. Dr. Lehman states that detoxification of pyrethrins in rats is so rapid that the animals can ingest more than an acutely fatal dose every day throughout their lifetime with little or no injury. This means that the amount of pyrethrum, uniformily mixed in food, which rats can consume without harm during 24 hours is even greater than the acute LD/50 dose because of the high rate of detoxification of pyrethrum in the stomach.

The safety of piperonyl butoxide was first studied acutely by Dr. M. P. Sarles, W. E. Dove and D. H. Moore, and their results appeared in January, 1949, in the *American Journal of Tropical Medicine*, (Vol. 29, pp. 151-166). Following these studies, chronic feeding tests and other studies made by M. P. Sarles and W. B. Vandegrift, were published in September, 1952, in the *American Journal of Tropical Medicine and Hygiene*, (Vol. 1, pp. 862-883).

Dr. A. J. Lehman repeated much of this work and found that the oral LD 50 in rats for piperonyl butoxide was 11,500 mg./kg. In chronic feeding tests on rats, the lowest concentration that showed gross effects upon the animals was 5000 parts of piperonyl butoxide per million parts of food. At this level, there was some damage of tissues that was of a reparable nature.

Extended studies by Sarles and Vandegrift gave early evidence of the low toxicity of piperonyl butoxide to warm-blood animals. This work was followed by subacute toxicity tests, by a range in dosages in chronic toxicity tests on rats and dogs, with a low dosage chronic test on goats, with a short-term experiment of low and moderate dosages on monkeys, and by an extended use of sprays for four years on beef and lactating dairy cows. The following is a summary of the results:

1. In laboratory tests, there was a low order of toxicity which showed little difference in susceptibility between sexes or between species of animals.

2. Chronic feeding tests beginning at weaning time of the young rats and extending through three successive generations were conducted on the amounts of food consumed, the gains in weight of the animals and for possible effects upon reproduction. In these studies, there were no indications of any cumulative toxic effects in the second and third generations, even for consumption up to 10,000 ppm of piperonyl butoxide in all of the food. Levels of 1000 ppm alone, also this amount plus one-sixth as much pyrethrins, were tolerated equally as well by healthy animals.

3. In one-year graded dosage experiments with dogs, in which the animals were fed six times a week by capsule, the ingestion of 3000 ppm of piperonyl butoxide was tolerated with only a moderate toxic effect.

4. At autopsy, histo-pathologic studies were made from microtome sections of tissues using conventional and special fixations, also by selective and general stains of the tissues of all organs of representative animals. These were made by Dr. William B. Vandegrift, a qualified pathologist, especially experienced in the study of rat tissues. He concluded that technical piperonyl butoxide is not carcinogenic for the liver. His studies also justify the conclusion that the compound did not exert a malignant tumorogenic effect upon the general tissues, nor upon the endocrine glands and breasts, also that it did not have an indirect general tumorogenic effect through disturbance of the endrocine glands.

5. Biochemical balance studies made on dogs showed that large doses of piperonyl butoxide fed by stomach tube are quickly eliminated in the feces, and that only traces appeared in the urine. From separate feedings, 78 and 87.6 per cent of the piperonyl butoxide were passed in the feces of the animals within 48 hours. This means that the material is poorly absorbed by the animal.

6. Cattle sprayed for control of flies and lice for four successive years, and also prior to and right up to the time that samples of meat and milk were obtained, showed no piperonyl butoxide in the muscle, fat tissues or milk.

*Buln Assoc. Food & Drug Officials Vol. 15, p. 125 (1952) also Vol. 15, p. 48.

7. Based upon the absence of any effects in Group IV of the second two-year experiment with rats, and allowing for a 100-fold safety factor, Sarles and Vandegrift found that there is conservatively a safe human tolerance for 42 parts piperonyl butoxide and 7 parts pyrethrins per million parts of food, even when these amounts are present in all food that is consumed.

Residues on Milled Fractions of Treated Grains

Using a calorimetric method that was developed for detecting small amounts of piperonyl butoxide by Howard A. Jones* and his associates, analyses were made of samples of different storages of wheat, corn and other grains at intervals throughout the periods of storage. The greater stability of piperonyl butoxide above that of pyrethrins, even when used together, readily suggested that one needs to consider only the butoxide present as an index to the presence of both materials. For both sprays and dusts that are used on grains, the two materials have definite ratios which are never less than 1 to 10.

The method of analysis for piperonyl butoxide was found suitable for whole grains, ground grains, wheat germ and wheat flour, when precautions were used for preventing interfering materials. As examples, on whole grains 88 per cent of the piperonyl butoxide was recovered from laboratory-treated wheat, and 93 per cent was recovered from similar samples of corn. Even better recoveries were obtained from ground grain and wheat germ. From wheat flour, there was an 80 per cent recovery from samples treated at 2.5 ppm, 85 per cent at 5 ppm, and 92 per cent at 10 ppm. Final color readings on duplicate extractions of a single sample usually show less than 5 per cent difference between maximum and minimum values. In making analyses, freshly treated samples are always included for showing the efficiency of the analytical method.

In all lots of stored wheat, corn, and other grains, the content of piperonyl butoxide declined consistently during a storage period of one year. After milling, as would be expected, the majority of the piperonyl butoxide appeared in the initial fractions of screenings and scourings. Some was found in the wheat germ fractions of samples milled after six to seven months' storage, but none was detected in these fractions after the wheat had been stored for one year. No piperonyl butoxide was found in flour.

Three corn storages in Georgia and Maryland were treated with the protectant powder mentioned above to give theoretical initial residues of 14.3 ppm of technical piperonyl butoxide. These showed 7 ppm after four months, 6.5 ppm after nine months, 6 ppm after ten months, and 2 ppm after 15 months of storage. Milled fractions of portions of the corn at 8, 12 and 15 months after storage showed no piperonyl butoxide in the grits, meal, flour, germ or bran.

In Missouri, two storages of corn, 3300 bushels each, were treated with protectant powder to give a theoretical initial deposit of 29.5 ppm of technical piperonyl butoxide. Eighteen samples from each of these bins, taken 18 months after treatment, averaged respectively 5.6 ppm and 5.2 ppm of piperonyl butoxide.

In Kansas, two storages of corn, 3300 bushels each, were treated with oil-free emulsifiable spray applied at the rate of 4 gals. per 1000 bushels, which gave a theoretical initial deposit of 12.2 ppm of technical piperonyl butoxide. Analyses made of milled lots at eight months after storage showed no piperonyl butoxide in grits, flour or hominy feed. Each milled lot showed 1 ppm of the compound in meal, a fraction of the grain that accounted for 25 per cent and 24 per cent of the weight of the whole corn. In one of these, the germ of corn represented 15 per cent of the whole corn and showed 16 ppm. In the other, the germ represented 17.9 per cent of the whole corn and showed 11.5 ppm of piperonyl butoxide. Calculations made from analyses of all these fractions showed the presence of 2.6 ppm and 3.5 ppm for the two lots of whole corn. Undoubtedly some of the piperonyl butoxide was lost by handling and tempering with water just before the grain was milled.

In Kansas also, five storages of 3300 bushels each, treated with 16.7 ppm piperonyl butoxide and 1.67 ppm pyrethrins were examined at regular intervals. At the end of 41 months there were no insects in three of the bins, and in two of them the insects averaged 0.25 per 1000 grain samples. The residues on whole grains for these bins, at the end of 41 months varied from 4.7 to 6.6. ppm of piperonyl butoxide.

Oats receiving 25 ppm piperonyl butoxide showed 10.5 ppm at the end of 13 months storage. Rice treated with an initial theoretical deposit of 17.6 ppm piperonyl butoxide showed 8 ppm at three months, 5.5 ppm at four months, and 3.0 ppm at the end of six months storage.

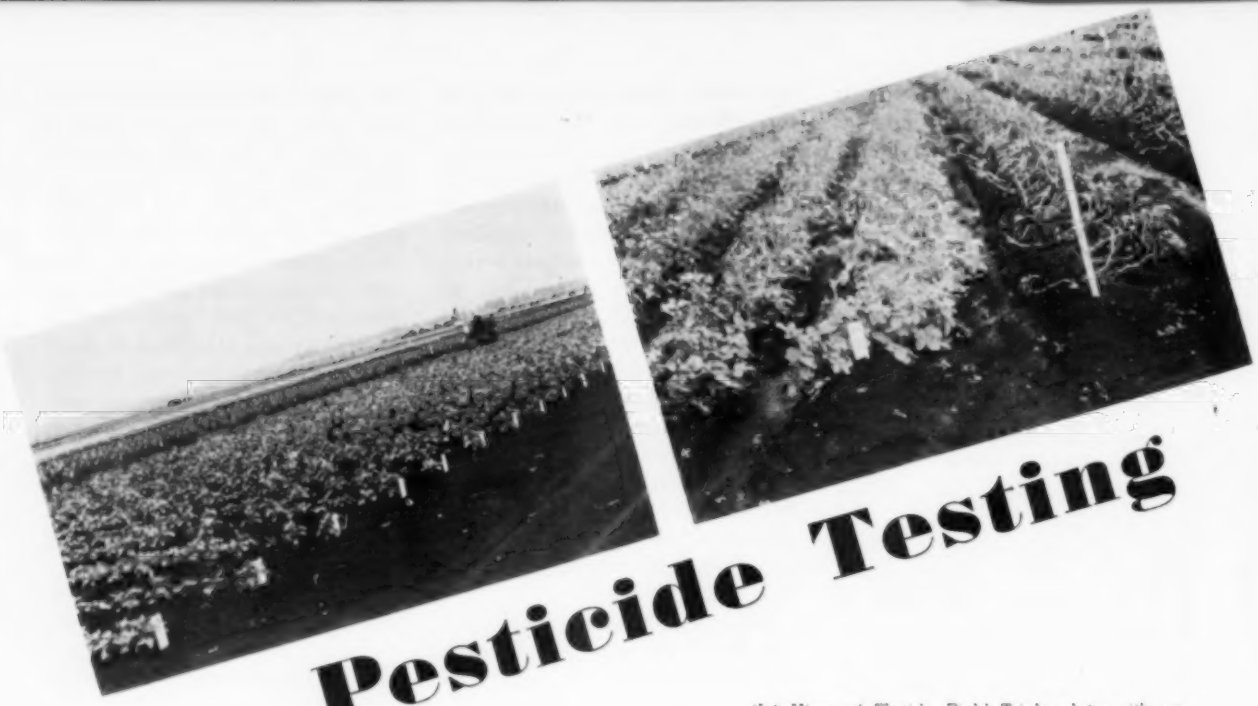
These residues illustrate the removal of, or reduction in, residual piperonyl butoxide in storage and in the milling process. They are representative of other studies made on different stored grains.

Residues for Other Commodities

The amounts of residues that remain on bulk nuts, peas and similar commodities from the use of space sprays that contain piperonyl butoxide and pyrethrins are exemplified by a treatment of bulk peanuts (ground nuts) in the husk. On the basis of use of the recommended amount of 2 gals. of spray that contained 5.0 per cent piperonyl butoxide and 5.0 per cent pyrethrins per 100,000 cu. ft. (assuming that all of the droplets entered the edible nuts), there would be a theoretical initial de-

(*Continued on Page* 113)

*Jour. Assn. Off. Agr. Chems. Vol. 35, pp. 771-780.



Pesticide Testing

(L.) View of Florida Field Trials plots with experimental sprayer in operation.

(R.)View of a potato fungicide trial; late blight controlled on row at left center; check row at right killed by late blight.

FIELD testing of pesticides covers a broad field of operations by the personnel of research and development departments of the chemical industry in cooperation with agriculturalists throughout the country. Industry employs chemists, entomologists, plant pathologists, and other technicians to conceive, synthesize, formulate, screen, develop, and promote the sale of a multitude of products falling in the general classification of pesticides. These products, when proven by field testing, become the agricultural pesticides of tomorrow. It is safe to say that thousands of new formulations are introduced each year, but that very few of these become successful competitors in the pesticide market. The successful promotion of a new pesticide involves years of effort by teams of workers, at the expense of thousands,—even hundreds of thousands of dollars.

Field testing is only one of the links in a chain of events that occur in the developemnt of a pesticide. Someone, (be he chemist, pathologist or entomologist) must first conceive an idea for devising a new or more effective molecular configuration. An organic chemist would most likely be called upon to prepare the compound. Other chemists must devise industrial processes for its economical production. Teams of biological scientists in company or institutional laboratories must screen each new compound to determine its place as a pesticide. Toxicologists are called upon to determine its mammalian toxicology, that researchers may be advised of any hazards in handling the product. When these steps have been followed in logical sequence, the new product is ready for field testing, to determine its uses and competitive position.

We have been developing techniques at Florida Field Trials since 1946, to assist industry in the evaluation of pesticides under field conditions. Prior to 1946, the writer had been serving for fourteen years as plant pathologist with the Everglades Experiment Station. This experience in the field of vegetable crops pathology has been invaluable in developing an independent experiment station serving the agricultural chemical industry.

The Florida Field Trials are located a short distance to the southeast of Lake Okeechobee in south-central Florida. The growing season here completely reverses that of other areas. Planting begins in September, and the last crops mature in June. The chances against a frost in this area before December 20, or after February 15 are about three to one. Cold sensitive crops (potatoes, tomatoes, corn, beans, etc.) are grown as fall and spring crops, while the hardier crops (celery, cabbage, lettuce, etc.) can be grown in winter months as well. During the growing season, rainfall averages 9 inches in September, and varies from 1.5 to 5.2 inches in the remaining months. Water for irrigation is available from Lake Okeechobee. Canals and pumps provide drainage when rainfall is heavy. The monthly mean minimum temperatures range from 53° to 70°F., and the mean maxi-

in Field Trials

by G. R. Townsend

Dr. G. R. Townsend is the owner and director of Florida Field Trials, Belle Glade, Fla. Until he started the service in 1946, he was plant pathologist at the Everglades Experiment Station in Fla.

mum temperatures vary between 75° and 87°F. Day length declines from about 12½ hours in September to less than 11 hours in December, and then increases to 13½ hours by the end of the season.

The heavy muck soil on which the trials are located is particularly well adapted to this use, because it is uniform in composition, level, and easily worked. Drainage and irrigation are provided by a system of tile drains, ditches, and pumps. The soil analysis shows an organic composition of about 80 percent. It has a high water holding capacity, and in its natural state is rich in nitrogen, but rather deficient in other nutrient elements. Application of potash, phosphorus, copper, manganese, and zinc make it fertile for a wide variety of crops.

Since the growing season in southern Florida is in months when agricultural activity elsewhere in the United States is at a minimum, use of Florida Field Trials can accelerate a research and development program. As an example, it is possible to obtain two sets of data on potato late blight fungicides in these trials in the interval when potatoes cannot be grown in northern states. Information from these trials can be used to direct research along more profitable lines when new summer trials are started.

Foliar fungicide trials are conducted mainly with six crop-disease complexes—i.e. late blight of potatoes (*Phytopthora infestans*), early blight of celery (*Cercospora apii*), downy mildew of cucumbers (*Pseudoperonospora cubensis*), leaf blight of sweet corn (*Helminthosporium turcicum*), foliar diseases of tomatoes (*Phytopthora, Stemphylium, Alternaria*), and crown rust of oats (*Puccinia coronata*). These crops and diseases provide a sequence of trials running from early fall to late spring. If this entire array of diseases is used for testing compounds, it provides a wide spectrum analysis of fungi-toxicity. The diseases listed occur each year without the use of artificial methods of inoculation. When conditions are right, the diseases develop naturally, and generally very severely because of the prevalence of moderate temperatures, heavy dews, and at times, dense fogs at night. After dry periods in the warmer months, showers seem to be necessary to start disease development if the muck surfaces have become too dry to produce a damp micro-climate under the plant. The severity of the diseases is normally enough to reduce yields and quality of non-sprayed crops in the above list.

Several soil fungi become active pathogens on a large variety of crops grown in our soil. These fungi attack seeds, roots, and underground portions of the stems. The principal fungi concerned in these attacks belong to the genera *Rhizoctonia, Fusarium, Pythium, Sclerotinia, Sclerotium*, and *Streptomyces*. No attempt has been made to test fungicides against specific organisms among this group since they represent a normal flora of pathogens in soils everywhere, and because they present a broader base for the evaluation of fungicides. A fungicide that might be found effective against only one of these fungi might not be competitive with one fungitoxic to most or all of the pathogens listed.

Successful seed treatment tests can be conducted with peas, spinach, beets, lima beans, peanuts, and sweet corn. Greater interest, however, now is attached to treatments of the soil with materials intended to suppress the activity of pathogenic fungi in the soil. This may be the field of greatest potential for fungicide exploration. We have a few effective materials now, and the results with these indicate that crop response may be considerably more than the mere preservation of the plant, and that seemingly minor infections play important roles in plant health. The test crops best suited for soil fungicide experimentation in this area are peas, peanuts, cucumbers, okra, lima beans, and corn. Trials with potatoes for the control of com-

mon scab have not been conducted, but would appear to be warranted on areas where potatoes have been grown a few times.

The field testing of insecticides presents greater problems than occur with fungicide tests. The most important of these is the less predictable nature of the insects. In many cases, also, it is not possible to rate the results with insecticides by scoring as we do on fungicide plots. However, we are able to make standard tests against some of the more common insect pests. Successful tests can be made on sweet corn against the budworm and ear worm (*Heliothis zea*), which is also the pest known on cotton as the boll worm, and on tomatoes as the fruit-worm. Cabbage can be used for tests against three leaf-feeding worms (*Pieris, Autographa*, and *Plutella*), and against the cabbage aphid (*Brevicoryne brassicae*). Peppers and okra are good for tests against aphids (*Aphis gossypii* and others). Okra also is good for testing against the serpentine leaf-miner (*Agromyza pusilla*).

Successful tests of herbicides as pre-planting, or pre-emergence treatments can be made. In these tests the principal weeds are species of wide distribution—such as purslane (*Portulaca oleraceae*), crab-grass (*Digitaria sanguinalis*), goose-grass (*Eleusine indica*), and the spiny amranth (*Amaranthus spinosus*).

The root-knot nematode (*Meloidogyne incognita*) attacks severely tomatoes, lima beans, squash, okra, carrots, beets, lettuce, and celery under the cultural conditions prevailing in our area. Many generations of the nematode occur in a year, because of the long warm season, and infestation of crops needing a long growing season may become very severe. Some crops not listed above seem to be less affected by the root-knot than those listed. This may be due to strain differences in the nematode species. Successful testing of nematocides can be accomplished during the warmer months; i.e. September to November, and March to May.

Certain plant diseases occur here, which to date are either uncontrolled, or controlled only poorly by known procedures. These include bacterial blight in peppers, and virus diseases in peppers, tomatoes, squash, and cucumbers. These problems are a challenge to try new chemicals or new procedures.

All types of tests for the evaluation of agricultural chemicals may at times disclose certain compounds that are phytotoxic. This may occur on all species tested, or only on certain species that are more sensitive to the chemical. Phytotoxicity also may occur at some times and not at others on the same species. The effects may be severe burning of leaf tissue, stippling with necrotic spots, chlorosis, dwarfing, and malformation, or in some cases, yield reduction without visible symptoms of phytoxicity.

The responsibility placed on the chemical industry by the Miller Act makes it necessary to prove that the residual deposits of fungicides and insecticides on crops used for human consumption do not exceed tolerances set by the FDA. In the case of new compounds, it is first necessary to show what residues exist after the crop has been sprayed, and through toxicological tests, to determine what amount of residue can be tolerated. The necessary samples for residue analyses can be supplied from the plots used in testing the compound, or from separate plots set up solely to produce the residue samples.

Successful field trials depend on experimental procedures adaptable to the cultural practices of the area, and suitable technically to the purpose of the experiment. The aim at Florida Field Trials has been to retain as much simplicity as possible, and yet through design and procedure to secure experimental results that can be reproduced not only in our own trials, but in other trials also. For this reason, we list a number of standard trials in which we believe we have competence, and discourage extensive testing beyond our present abilities. Small trials to investigate new methods, or probe new fields of experimentation will not be refused.

A plot is the basis of all field testing. In our work, the plot used for foliar applications consists of one fifty foot row of the crop desired. Usually, these rows are spaced four feet apart, because we have standardized our equipment on this spacing. However, for some spreading of tall crops, we use an eight foot row. Soil treatment plots

(*Continued on Page* 122)

This photo illustrates the pattern of spray distribution obtained with the single row experimental sprayer used for testing pesticides.

Fertilizer in the Future

NPFI on the Move—

to highlight annual convention

THE fourth annual meeting of the National Plant Food Institute, to be held June 14-17 at the Greenbrier Hotel, White Sulphur Springs, W. Va., is expected to attract some 1000 members of the fertilizer industry. Theme of the convention is "Fertilization in the Future," with comments from such industry experts as, L. D. Baver Hawaiian Sugar Planters' Association; J. Fielding Reed, American Potash Institute; and R. J. Hildreth, Texas Agr. Exp. Station.

MONDAY, JUNE 15

Progress Report on NPFI Activities
By Richard E. Bennett, president of the National Plant Food Institute, also president of Farm Fertilizers, Inc., Omaha, Neb.

NPFI on the Move — Panel discussion with Russell Coleman, executive vice president of NPFI, as moderator
Participants:
Richard B. Bahme, NPFI western regional director
Spreading the Word About Fertilizer
Zenas Beers, NPFI midwest regional director
Raising Farmers' Sights
Samuel L. Tisdale, NPFI southeast regional director
The Intensified Approach to the Fertilizer Market
R. A. King, North Carolina State University, and
M. S. Williams, NPFI agricultural economist
Predicting Next Year's Fertilizer Sales

NPFI Business Meeting

NOON

Fertilization in the Future — Moderated by W. R. Allstetter, vice president of NPFI
L. D. Baver, Experiment Station of the Hawaiian Sugar Planters' Association
Scientific Feeding of High Value Crops
J. Fielding Reed, American Potash Institute, Inc., Atlanta
Converting Low Value Crops into High Value Crops
R. J. Hildreth, Texas Agricultural Experiment Station
Minimizing Weather Risks with Fertilizer

TUESDAY, JUNE 16

Cash in on Grass — National Plant Food Institute film
What's Happening Down on the Farm
Earl F. Crouse, Farm Business Council, Urbana, Ill.
What's Needed in the Farm Program
Rep. J. Whitten (D. Miss.)

National Plant Food Institute Banquet

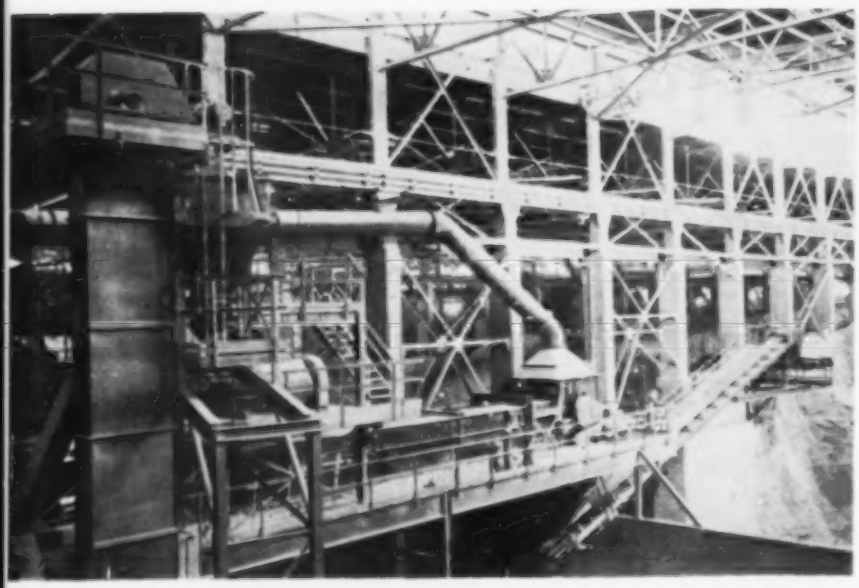
A featured speaker at the June 16th sessions will be Rep. Jamie L. Whitten (D.-Miss.), chairman of the House Subcommittee on Agricultural Appropriations, who will report on "What's Needed in the Farm Program." Continuing this line of discussion, Earl F. Crouse, Farm Business Council, will review, "What's Happening Down on the Farm."

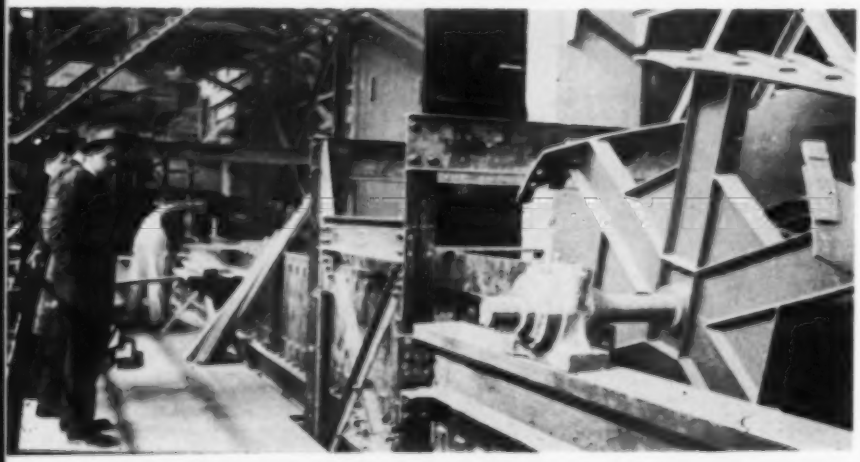
In the past year, the Institute has expanded tremendously its activities, all designed to develop and extend the fertilizer market. First step in the program was the survey conducted two years ago, to determine "What factors influence the farmer."

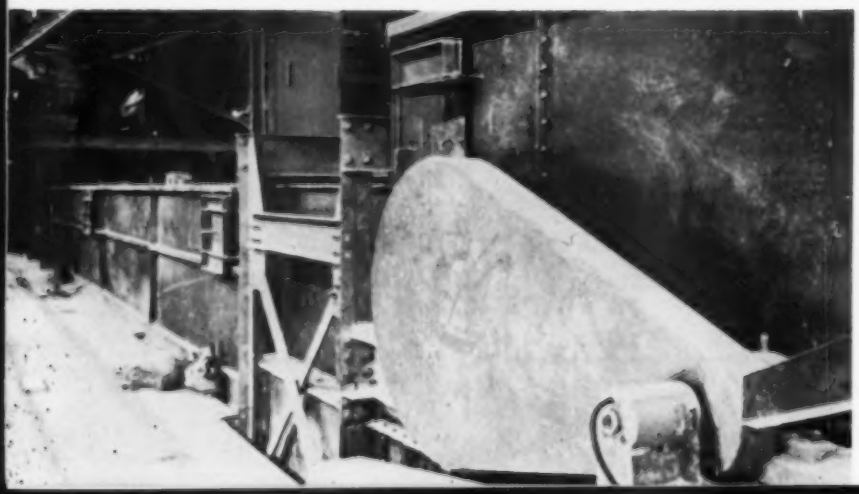
NPFI national reorganization, with regional offices and directors, provided the means for reaching all farmers, directly, with attention directed to specific local conditions and problems. Reporting on the NPFI program will be NPFI regional directors, Richard B. Bahme (west); Zenas Beers (midwest); and Samuel Tisdale (southeast). Russell Coleman, executive vice president of NPFI will moderate a discussion panel "NPFI on the Move."

The session will conclude with comments by R. A. King, North Carolina State University and M. S. Williams, NPFI agricultural economist, who will "predict next year's fertilizer sales."

Davison Installs *Super Flo*







A new chapter in high speed superphosphate production is being written by the performance of the Sackett Patent "Super Flo" Process, which is now in operation at the Baltimore (Curtis Bay), Maryland plant of W. R. Grace & Co., Davison Chemical Division. This 100-ton per hour continuous process was designed, fabricated and installed by The A. J. Sackett and Sons Company of Baltimore on a turnkey basis. It replaces several high cost batch-type acidulating units employed formerly in this plant.

Before deciding upon the installation of this new process, Davison's Research Center made an intensive study of the superphosphate produced by one of these units at another plant. This study included conversion efficiencies, particle size analysis, ammoniating qualities and flow characteristics of the product. Another detailed study made by Davison revealed the substantial labor, power and maintenance savings offered by the new process.

Installed in Davison's large five-crane bay plant, the new process produces a continuous flow of highly converted superphosphate, eliminating many time-consuming manual operatings required previously.

One of the most striking features of the Super Flo process is the accuracy with which the rock-acid ratios are controlled. and the uniformity of analysis in the end product.

Phosphate rock ground to the proper fineness is delivered to a

Photos, top to bottom:

A. General view of Super Flo Process
B. Construction view showing sol'di-fier and cutter.
C. Solidifier and cutter with covers and housing in place.

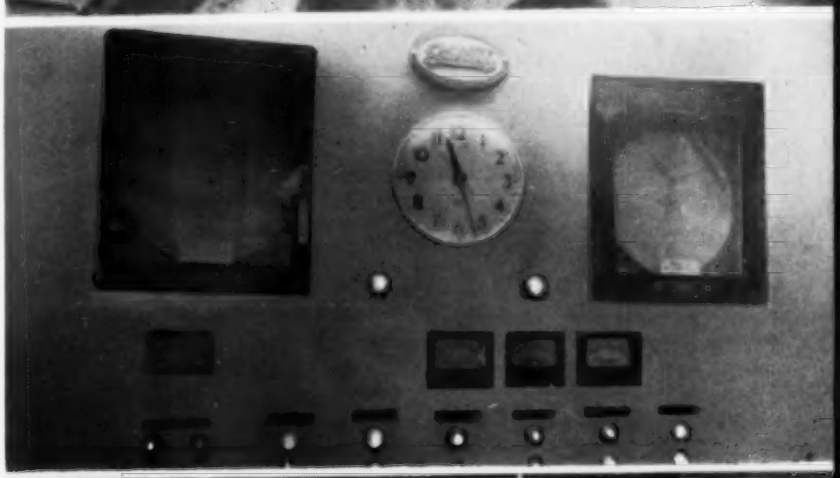
self-compensating type continuous weighing machine, which accurately weighs the rock and delivers it to a T.V.A. type mixing cone. Sulfuric acid, together with the required amount of tempering water, is continuously metered and introduced with the rock into the cone. From this point, the resultant slurry flows into the puddler, wherein an intimate mixing and kneading of the mass is accomplished. The thickening slurry flows from the puddler to the solidifier, which slowly conveys the 6′ wide by 3′ high cross-sectional mass of the material-in-process to the discharge end of this machine. At the point of discharge, a helical rotating cutter shaves the now hardened mass from the solidifier and transfers the material to the belt conveying system to either of two crane bays.

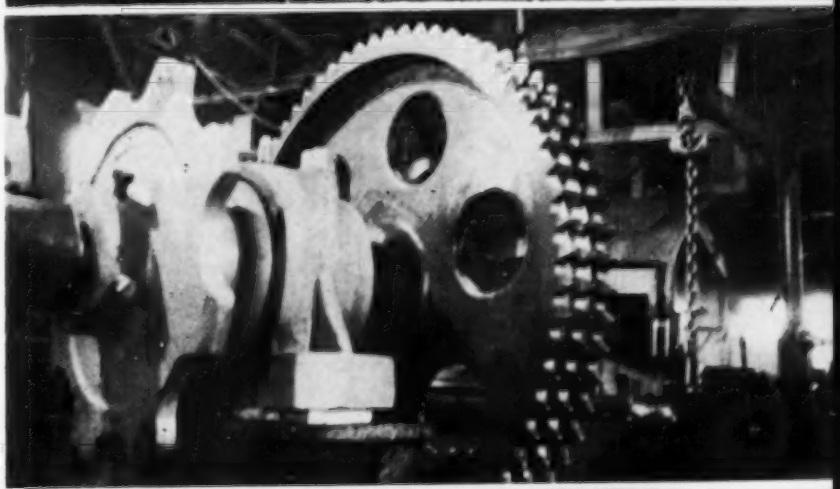
To insure maximum equipment life, the mixing cone, the puddler, the solidifier covers and the entire fume exhaust system are all provided with bonded Neoprene linings.

The product manufactured by this new installation has a noticeably hard grain structure, but its high porosity gives it excellent ammonia absorption properties.

On other Super Flo installations, similar to but smaller than Davison's mammoth process, Sackett engineers in collaboration with operators have devised a technique for manufacturing granular superphosphate directly at no extra cost. Double deck screens may be employed in the classifying and shipping center to remove one-third or more of the total product as a −6 +16 mesh granular fraction, thus eliminating after treatments, which are required ordinarily.

(Continued on Page 119)





Photos, top to bottom:

D. View showing constant high speed stream of superphosphate to crane pit.

E. Partial view of control panel.

F. View showing rugged proportions of solidifier drive shaft.

G. An old batch den now abandoned.

what's your E.Q.?*

QUESTIONS

	True	False
1. Inorganic salts are frequently added to oil-water systems to break emulsions.	☐	☐
2. It is impossible to prepare practical emulsions in which the aqueous phase contains high concentrations of inorganic salts.	☐	☐
3. Good agricultural emulsifiers may be characterized as individual specific chemical compounds.	☐	☐
4. The anionic components of an agricultural emulsifier impart improved performance in soft water.	☐	☐
5. A good emulsifier can be fully characterized by the ratio of anionic to nonionic components.	☐	☐
6. The active ingredient content of an emulsifier is the chief criterion of its efficiency.	☐	☐
7. Variations in toxicant, solvent and waters require adjustments in emulsifier blend for optimum performance.	☐	☐
8. The ratio of the emulsifiers in a matched pair need not be altered when the concentrate is used at high or low dilution rates.	☐	☐
9. In general, it is safer to formulate slightly higher on the nonionic side than on the anionic side when employing matched pairs.	☐	☐
10. Most formulators use the correct amount of emulsifier in their emulsifiable concentrates.	☐	☐

*Emulsifier Quality

ANSWERS

1. True. Most emulsifiers "salt out" in the presence of inorganic salts which impairs their function and breaks the emulsion.
2. False. Emcols H-A, H-B and H-C are used to emulsify insecticides in concentrated mixed fertilizer solutions in which the salt concentration may approach saturation. These emulsifiers have a unique tolerance to high salt concentrations.
3. False. Most efficient agricultural emulsifiers are blends of several anionic and nonionic surfactants.
4. True, if properly balanced with nonionic components. Conversely, the nonionic components of such an emulsifier impart improved performance in hard water.
5. False. It is not sufficient to balance the anionic-nonionic ratio. Since both anionic and nonionic components have hydrophilic and lipophilic properties, each in turn must be properly balanced to obtain maximum efficiency at the minimum use level. This requires blending several components, in some cases as many as 12 different surfactants.
6. False. The composition of the separate components and their balance is the prime consideration.
7. True. This is achieved most conveniently by the use of matched pairs of emulsifiers.
8. False. The rate of dilution required by the particular field application affects the blend of the matched pair necessary for optimum performance.
9. True. An excess of nonionic may result in excessive creaming which can easily be redispersed, but an excess of anionic may result in a tendency toward oil separation.
10. Only you can answer this. If you are using Emcols, you are saving money because they can be used at low use levels and give outstanding aging stability. Low moisture content, the rigidly controlled components, and Emcol know-how allow you to manufacture superior concentrates at competitive prices.

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Insect Control on Cotton

by J. W. Rawson and F. S. Arant*
Alabama Polytechnic Institute
Auburn, Ala.

COTTON insects must be controlled for economical production. Unless a good control program is followed, profitable yields cannot be made.

Many reports of resistant or hard-to-kill weevils have been heard in recent years. Results of laboratory and field studies in Alabama show no evidence of inherited boll weevil resistance to insecticides normally used for control. However, there has been a difference in ease of killing between different aged weevils and during different periods of the season. In general, it was found that 9-day-old weevils are harder to kill with BHC or toxaphene than 2-day-old ones, and boll-fed weevils are harder to kill than those that have fed on squares. These differences were not noted when using guthion.

Chlorinated Hydrocarbons

Satisfactory control of boll weevil and various other cotton insects has been obtained with the chlorinated hydrocarbon insecticides – aldrin, dieldrin, BHC, endrin, heptachlor, or toxaphene. When bollworms are a problem, DDT is added to these materials, except in the case of endrin and toxaphene. Chlorinated hydrocarbon insecticides will not control aphids or spider mites.

Results of three years study by the API Agricultural Experiment Station show that chlorinated hydrocarbons have fairly long-lasting effect. Applications of 30 to 40 lb. of 20% toxaphene or 2% endrin dust per acre at 8-day intervals were as effective as 15 to 20 lb. put on every four days.

Tests with granular heptachlor show promise of good boll weevil control with only two applications. The 5% heptachlor granules were put out at the rate of 40 lb. per acre just before emergence of the first and second generations of weevils. This treatment gave as good weevil control as did 12 dust or spray applications. Heptachlor granules are not effective against bollworms.

Phosphate Insecticides

Malathion, methyl parathion, and guthion (organophosphate insecticides) give satisfactory control of boll weevil, aphids, some species of spider mites, and other cotton insects. As with other materials, proper timing of applications and use of correct amounts are necessary. Malathion and methyl parathion are relatively short lasting, but guthion has a relatively long residual effectiveness.

Results of three years research indicate that 30 to 40 lb. of 2.5% guthion dust per acre at 8-day intervals is as effective for boll weevils as 15 to 20 lb. applied every 4 days. Parathion, ¼ lb. per acre, controlled aphids and some species of spider mites. Poor results were obtained with 2% parathion and 5% malathion dust applied at rate of 20 lb. per acre for control of the strawberry mite. Demeton (systox), ¼ lb. per acre, controlled aphids and most species of mites infesting cotton. This material lasts 2 to 8 weeks. Demeton and parathion are not recommended for boll weevil control.

Several of the new organophosphates show promise of controlling one or more species of cotton pests. Two per cent trithion and 4% ethion dusts, 20 lb. per acre, has satisfactorily controlled strawberry mite in northern Alabama. One-half pound per acre of delnav was also effective against mites. Trithion (2% to 4%) applied at 20 lb. per acre and delnav, ½ to 1 lb. per acre, showed promise of controlling boll weevil in limited experiments. Trithion is also effective against aphids. In preliminary tests, American Cyanamid 12880, 1 lb. per acre, was effective against aphids and mites and had relatively long residual life. The organophosphates will not control bollworm.

Except for malathion, the phosphate materials recommended for cotton insect control are more hazardous than most other cotton insecticides. Endrin is more toxic than the other commonly used chlorinated hydrocarbons.★★

*This review appeared in the Spring, 1959 edition of "Highlights of Agricultural Research, a quarterly publication issued by the Agricultural Experiment Station of API, Auburn, Ala.

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Steam... IN GRANULATION

Fertilizer production men recognize the problems of granulating certain grades of fertilizer. They also are aware of the fact that granulation can be achieved by introducing steam below the roller bed. The economics of using steam in granulation was reviewed at the Fertilizer Industry Round Table in Washington, D. C., November 5-7, 1958. Reported here are the comments by T. J. Bosman of Federal Chemical Co., Nashville, Tenn., and T. R. Schmalz of F.S. Royster Guano Co., Norfolk, Va.

Comments by T. J. Bosman

Federal Chemical Co.
Nashville, Tennessee

WHEN we first started using steam, it wasn't a question of economics, it was just plain necessity to achieve granulation in certain formulas. We all knew 1-4-4 ratios were hard to granulate. At times 1-2-2 ratios caused trouble.

In certain sections where we do business 4-16-16 and 5-20-20 account for considerable tonnage. Early in 1955 the demand for these grades in a granulated form was becoming so strong, we could not ignore it any longer. We had been trying to granulate these grades, but had made only a semi-granulated goods.

It was known granulation could be achieved by slugging the mix with excess sulphuric acid. We also knew this was expensive on two counts, the cost of the acid and the maintenance of the equipment. We had heard steam might be an aid in granulating 1-4-4 ratios, so we started to investigate this angle. It didn't take us long to find out there wasn't a great deal known about this phase of granulation. However with encouragement from T.V.A. and a certain equipment manufacturer we installed Clayton Boilers rated at 100 horse power.

At our Danville Plant, where we had a separate meter for the gas used to generate steam, we found the fuel consumed cost us $0.05 per ton of fertilizer. All other costs, after the original installation, were nil. We found, as have others, that steam was only a temporary expedient and we soon started looking for better methods. The advent of phosphoric acid was an aid to better granulation, but caused other complications. The build-up on spargers was much faster than previously. This condition was further aggravated by the use of steam and could shut down the plant in a short time. Still some added heat is necessary for good granulation.

We have tried hot water as a heat source, – and this has proved to be more satisfactory than steam. On the other hand, – we do use steam to heat the water through a heat exchanger. In this way, we have cut the fuel bill from $0.05 per ton to $0.02 per ton. Our staff is still investigating ways in which to eliminate the use of steam completely.

In conclusion, I would say that steam is an economical method for granulating 1-4-4 ratios if you do not have the means to eliminate it. However, I hope we will be able to eliminate steam and make a still better product. Although $0.05 per ton doesn't sound large, every penny we can save helps, particularly during these times. There still remains a great deal of work to be done in making a superior product at a more economical cost.

Re: Failure or Success in Using Steam for Granulation

by T. R. Schmalz

F. S. Royster Guano Co.

THE question of whether steam is economical in granulation cannot be answered by a simple yes or no. Depending upon such factors as relative cost of P_2O_5 in super, triple and phosphoric acid, the cost of sulfuric acid, the grades manufactured in a given factory and the method of manufacture, steam may or may not be economically beneficial.

Steam is of no benefit in 1-1-1 ratio grades or other grades over 10% nitrogen. On the other hand, 1-4-4 ratio grades, low nitrogen grades, can be granulated more economically with steam than with acids. In our particular case, where TVA ammoniators are used and where large tonnages of 1-4-4 grades are produced, steam generating and handling equipment was easily justified by savings of from 50 cents to $1.50 a ton.

Another benefit in addition to the economic considerations can be cited. Where sulfuric acid is being used for granulation, a reduction in fumes is accomplished by replacing acid with steam.

We have no first hand experience with phosphoric acid use, but from reports of others, the indication is that steam is beneficial when used with phosphoric acid.

Frankly, we are not sure that we are using steam to the utmost advantage. Depending on grade, rate, recycle rate, drying costs, and other such considerations, the optimum conditions of formulation and operation will vary.

(Continued on Page 121)

the Relationship between Equipment Size Production Rate Production Costs

Mr. Marburger spoke at the Fertilizer Industry Round Table, Washington, D. C., November, 1958.

by Grant C. Marburger
Spencer Chemical Co.
Kansas City, Missouri

THE per ton cost of production increases as the production rate decreases! Henry Ford proved this principle many years ago in the concept of mass production. In fertilizer manufacture, the cost of raw materials must be separated from all other production costs to obtain a realistic picture, because formulation can affect production rates in some grades under some instances. When this occasion arises, the principle of mass production must be varied. The grade to be produced and other considerations of the case must be given individual attention to arrive at an economic balance; it cannot be done by general principles alone. The variables are a function of the equipment available, the formula, and the delivered costs of raw materials at that location.

One example might be cited. In low nitrogen-high phosphate ratios, such as 4-16-16 or 5-20-20, there are a number of variables which can be used to create the liquid phase necessary to achieve granulation. Water is one of them. Others include sulfuric acid, steam, phosphoric acid, ammonium nitrate or other soluble salts. If water is utilized rather heavily to achieve granulation, the dryer capacity in a given plant might be insufficient to allow as high a production rate as would be possible with less water and more sulfuric acid. The additional cost of sulfuric acid would have to be balanced against the higher production rate.

Very little more can be said about the per ton cost of production in a discussion designed to cover basic principles only.

An economic study based on specific technology is the next step, and no such generalization of this has been prepared to be presented here.

It is difficult to be definite on relationships between equipment size and rate of production. Frequently in the past, small plant production has included another factor: lower quality product. So experience is lacking for accurate comparison of the equipment sizes that are necessary to produce the same quality granule at different rates of production.

In any plant, small or large, the question can be asked: What is the first bottleneck which will limit the production rate? The answer to this question frequently is revealing. In the past, the product screens have most frequently been the emphasized item. This generally means a larger screen is needed. Yet in some cases the plant's operation can be changed to correct wet material which is blinding the screen and lowering its capacity. A plant producing ten tons per hour can purchase a smaller screen than one designed for 30 tons per hour.

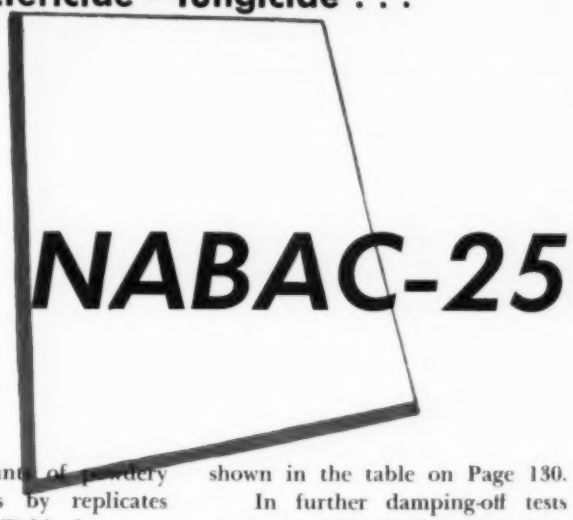
In most plants the dryer size is too small. The mechanical condition of the finished product is dependent upon the moisture content more than any other one thing. When insufficient capacity occurs, there is compensation by increasing the dryer temperature, but decomposing heat-sensitive materials can cause plant food loss, or an air pollution nuisance. In the case of overheating, decomposition of grades like X-O-X will produce fumes dangerous to humans.

Improperly designed plants will seriously limit capacity in both dryers and coolers. The exact relationship between rate of production and the dimensions of drying and cooling vessels cannot be simplified to a single set of rules. The formulation, practices used, grades produced, quality of product desired, and other variables are involved.

Undersized dust collection systems can affect production rates in areas concerned with air pollution. However, the size of the dryer and cooler will determine the volume of air to be handled by the cyclone dust collector.

(*Continued on Page* 119)

A new bactericide—fungicide . . .



THE results of additional studies on the new organic plant bactericide, "Nabac 25," a product of Nationwide Chemical Co., Fort Myers, Fla., have just been made public by the company. Originally introduced specifically for use in protecting peppers and tomatoes against bacterial diseases, the field of application for Nabac 25 has been considerably expanded on the basis of more recent test work. Label claims have been filed for use on celery, cabbage and cucurbits. Tests have also been run on peaches, cherries, and many other crops, but no application will be made for registration of the new product for use on other crops, until more work has been done.

Use of Nabac 25 with zineb (at a reduced dosage) greatly enhanced control of downy mildew on cucumbers. In addition it provided control of powdery mildew and angular leaf spot. Yield was increased substantially, and belly-rot was reduced. The following test data were reported from Nationwide's experimental farm at Estero, Fla.

Table 1

	Yield in bu. per acre	Belly-rot No. per acre
1. Nabac ½ lb. plus Zineb 1 lb. (avg. of 2 replicates)	612	640.0
2. Zineb 2 lbs. (avg. of 2 replicates)	445	3712.0
3. Nabac ½ lb. plus Maneb 1 lb. (one replicate)	396	0.0
4. Tribasic copper 4 lbs. (one replicate)	279	2560.0
5. Copper zinc chromate 2 lbs. (one replicate)	317	6768.0
6. Nabac 1 lb. plus Zineb 2 lbs. (one replicate)	564	256.0
Note: Ave. belly-rot counts of 4 replicates with Nabac —		384.0
Ave. belly-rot counts of 4 treatments without Nabac		4188.0

In another test designed specifically to study efficiency in control of powdery mildew infections on cucumbers, Nabac at either one or two pounds provided control markedly superior to zineb at two pounds. The count of powdery mildew infections by replicates were as shown in Table 2.

Treatments were applied May 5, 9, 16, 21, 26, 30. Counts were made on one marked runner of each plant in each replicate (5 plants per replicate). Data were taken June 2, 1958, on the farm of Dan Travis at Fort Myers, Fla.

In damping-off tests on seven vegetables (snap beans, lima beans, tomatoes, peppers, cucumbers, cabbage, watermelons) Nabac is reported to have provided superior control, with a low incidence of damping-off, a high average come-up and a top average percentage of good plants. Results were as shown in the table on Page 130.

Table 2

			TOTAL
Nabac 1 lb.	S1 - 0	S1A - 0	0
Nabac 2 lbs.	S2 - 0	S2A - 0	0
Zineb 2 lbs.	S23-25	S23A-18	45
Checks	No leaves left		

In further damping-off tests at the Dan Travis Farm on pinto beans Nabac gave superior control as compared with Thylate. Using Nabac, post emergence only, at ¾ lb., drenched at 200 gals. per acre equivalent, an average of 73.2% surviving plants was obtained. This was upped to 75% surviving when Nabac was applied both pre and post emergence. Untreated check plots were down to 52.7%, and in plots protected with Thylate, 2 lbs. per 100 gals., drenched as in the post emergence applications with Nabac, survival rates averaged only 43.5%.

Screening tests on bacterial spot of pepper were also conducted on the Dan Travis Farm. On three replicates the average number of bacterial spot lesions per plant on plants treated with Nabac 25 at 1¼ lbs. plus zineb was 3.8. With Nabac alone, at ¾ lb., the number was only 2.2. With agrimycin 500 the number of lesions was 6.3, with zineb alone 11.4, and with no treatment 11.5.

In the fruit tests, work was conducted at State College, Pa. in 1958 to determine if Nabac 25 at ⅔ lb. per 100 gals. would reduce brown rot on ripening cherries and would check leaf spot infection. Nabac reduced brown rot in one test by 49.9%. It also materially reduced cherry leaf spot infection.

(*Continued on Page* 129)

NITROGEN EFFECTS

THE use of commercial nitrogen fertilizers as straight goods is now a widely accepted practice in the production of corn. The problem of whether nitrogen fertilizer should not be applied is no longer questioned. Which type or form to be used to give the most practical and economical results is the chief concern. This investigation was undertaken to gain more information concerning this problem.

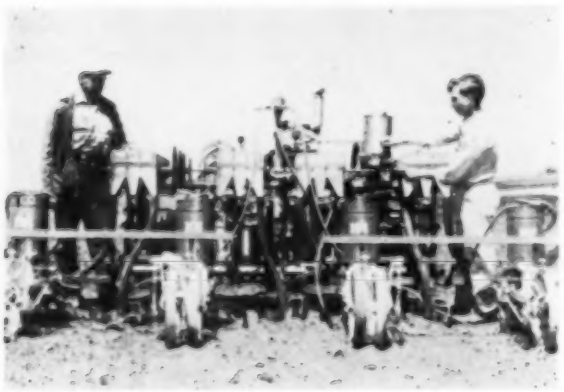
The experimental objectives were to determine:

1. The comparative effect of several straight nitrogen fertilizers on corn yields produced on different soil types regarding:
   (a) Yield response to rate of nitrogen fertilizer applied.
   (b) Yield response to type of straight nitrogen fertilizer applied.
   (c) Yield response to form (solid, liquid, or gas) of straight nitrogen fertilizer.
2. The relative effect of straight nitrogen fertilizer on the nitrogen content of corn plant tissue grown on various soil types.

Tests measuring the comparative yield effects of solid, liquid, and gaseous forms of commercial nitrogen fertilizers on corn were conducted in 1958 on several different soil types in West Central Minnesota. Commercial fertilizers used were: ammonium nitrate, 33-0-0; urea, 45-0-0; nitrogen solution, Uran, 28-0-0; nitrogen solution, Nitrana, 41-0-0; and anhydrous ammonium, 82-0-0. Treatments were replicated four times on each field. All fields were given a basic broadcast treatment of 0-20-20 at the rate of 400 pounds per acre. One adapted variety of hybrid seed corn was used on all fields. All fields received a premerge broadcast treatment of the weed chemical Randox T.

The problem of uniformly applying solid, liquid, and gaseous forms of nitrogen for comparative effects led to the design and assembly of a fertilizer machine which can be quantitatively calibrated to deliver desired amounts of these three forms of carriers on plot areas. The machine is designed to permit variable placement of the different forms of fertilizer such as broadcast, side-dress or deep placements. Planting attachments for corn and small grains are mounted at the rear of the machine. This provides for uniform placement and planting of crops tested on all treatments.

Climatological data was obtained from four U. S. Weather Bureau stations located within the general area of the experimental sites. All stations reported abnormally low precipitation during eight of the first nine months of 1958, with the level of precipitation being above normal only during the month of April. Above normal temperatures occurred during the spring and late summer. Average temperatures were subnormal only during the months of June and July.



Special fertilizer application unit designed and assembled at the University of Minnesota. The unit can be calibrated quantitively to deliver desired amounts of solid, liquid and gaseous forms of nitrogen to test plots.

One Year (1958) Results

NITROGEN starvation deficiency symptoms were vividly displayed by corn plants growing on the check plots of all experimental fields. These deficiencies were apparent in some degree on plots treated with 40 pounds of nitrogen per acre. On a few fields, nitrogen deficiencies were also noted on the 80 pound per acre nitrogen treatments.

The mid-summer drought provided a severe test on the effects of applying substantial rates of commercial fertilizer followed by dry growing conditions. Corn plants growing on the coarser textured soils exhibited the effects of moisture stress on the check plots, with leaves rolling up tightly and some leaf wilting occurring. On the plots where 40 and 80 pound applications of nitrogen per acre were applied, the corn plants seemed to be less affected by the dry soil conditions.

The superiority of one type of straight nitrogen fertilizer over another was compared on the basis of pooled averages of corn yields obtained from the 40 and the 80 pound rates of nitrogen applica-

*Assistant County Agricultural Extension Agent, Kandiyohi County, Minnesota.
+Professor, Department of Soil Science, University of Minnesota.

on CORN

—a report on the comparative effects of five nitrogen fertilizers on yield and composition of corn.

by R. C. Anderson and J. M. MacGregor

tion. Table 1 shows the comparative corn yields obtained from experiments on five types ranging in texture from sandy loam to silty clay loam, when treated with five different straight nitrogen fertilizers at rates of 40 and 80 pounds of nitrogen per acre.

Significant corn yield differences between types of straight nitrogen fertilizer occurred only on the Hanska sandy loam soil. On this field, ammonium nitrate (33-0-0), Urea (45-0-0) and Nitrana (41-0-0) gave more corn per acre than did either the anhydrous ammonia (82-0-0) or the Uran (28-0-0) nitrogen fertilizer.

The application of 80 pounds of nitrogen per acre supplied by any of the five straight nitrogen fertilizers investigated gave highly significant corn yield increases over the no nitrogen treatments on all soil types tested.

All of the straight nitrogen fertilizers studied gave significantly higher corn yields at the 40 pound per acre rate of nitrogen on the Barnes loam, Webster silty clay loam and the Harpstad Hammerly silty clay loam soil types.

All types of straight nitrogen fertilizers studied increased corn yields, significantly, when the rate of application was raised from 40 to 80 pounds of nitrogen per acre on the Barnes loam, Hanska sandy loam, Webster silty clay loam and the Harpstad Hammerly silty clay loam soils.

All forms of straight nitrogen fertilizers (solid, liquid or gaseous) were equally effective carriers of nitrogen fertilizers on all fields except the Hanska sandy loam. On the latter field, the solid and liquid forms of straight nitrogen fertilizer produced significantly higher yields of corn than were produced by the gaseous form of nitrogen fertilizer.

The nitrogen composition of corn leaves at bloom growing on various plots treated with different straight nitrogen fertilizers at the two rates is shown in Table 2. Percentage nitrogen in the corn ear leaf at bloom is considered to be a good guide in the production of corn yields. This determination is also important in that it is a rough measure of the protein content of the leaf tissue when multipled by the common conversion factor of 6.25.

The nitrogen content of ear leaves of corn growing on the Hanska sandy loam showed that ammonium nitrate (33-0-0) and Nitrana (41-0-0) nitrogen sources produced a significantly higher concentration of nitrogen in the corn leaves than concentrations present in corn leaves fertilized with either anhydrous ammonia (82-0-0) or Uran (28-0-0). The leaf nitrogen concentrations are in agreement with the actual corn yields obtained from this field.

The corn leaves grown on the Webster silty clay loam indicate that Uran (28-0-0) nitrogen produced significantly more nitrogen

(*Continued on Page* 125)

Table 1. 1959 yield of field corn following nitrogen fertilization at two rates of application on five different West Central Minnesota soil types.

Treatment	Soil Type: Barnes loam	Clarion clay loam	Hanska sandy loam	Webster silty clay loam	Harpstad Hammerly silty clay loam
	Corn yields in bushels per acre[a]				
33-0-0	87.1	74.7	62.3**	96.0	74.1
45-0-0	88.6	71.3	60.0**	95.5	72.0
82-0-0	85.4	74.2	56.9	93.0	72.7
41-0-0	80.8	83.9	67.2**	93.8	69.2
28-0-0	81.2	75.9	57.0	95.3	69.4
80# Nitrogen/acre.	90.6	79.2	64.9	99.3	75.4
#40 Nitrogen/acre.	78.7	72.7	56.4	90.2	67.6
Check	54.9	70.1	52.6	76.9	55.6
Difference 0-80# N/A.	35.7***	9.1**	12.3***	22.1***	19.8*
Difference 0-40# N/A.	23.8***	2.6	3.8	13.3	12.0*
Difference 40-80# N/A.	11.9***	6.5	8.5***	9.1***	7.8*

[a]Replicate averages corrected to 15.5% moisture.
* Significant at 10% level (F.90)
** Significant at 5% level (F.95)
*** Significant at 1% level (F.99)

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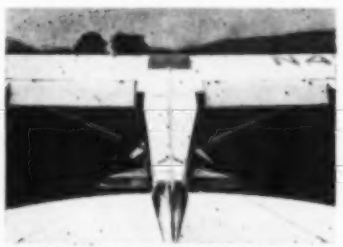

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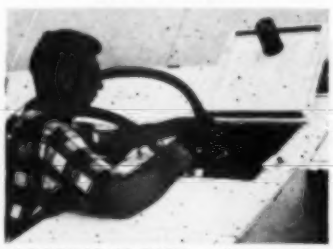

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The AGRICULTURAL Applicator

- Problems of Aerial Applicators
- Preparing Emulsion Sprays
- Desiccation of Legume Crops
- Kellett Displays Autogiro
- New Brush Control Developments

agricultural

A Remedy For

by Lloyd P. Nolen
Vice President — Agriculture
National Aviation Trades Assn.

MOST of us in the aerial dusting and spraying business have been kept pretty busy for the past twelve years. We have been busy selling our services to the farmer; busy building confidence and reputation. We have been kept busy trying to solve all the normal business problems: safety, financing, competition, collections, public relations, customer service, maintenance and many others. Running a business has been a full-time job.

From the looks of things, many of the applicators have done a good job. Most farming communities are served by one or more small airplane companies; companies with ability and integrity, providing a necessary service. They have played a big part in the increased per acre yields of many crops and have helped the growers and their communities to prosper. They have made the grade without government subsidies or long-term government loans. Until recently, they have had little help in developing airplanes and equipment. They have been busy doing these things for themselves.

Because we have been busy with local problems, many of us have failed to realize how many "outside" elements affect our business. Our local problems seemed the most urgent and important simply because we were closer to them and understood them better. When we take time to look around, we find that the *cause* of many of our "local" problems lies in outmoded or unjust state and federal laws under which we must work. We *must* find time to face these problems, if we expect to keep our business healthy.

Any time an industry becomes as large as ag-aviation, politics will become involved in the form of restrictive legislation and taxation. In the past, problems have come up that involved our airplanes. In some cases regulation was necessary. In many cases, laws were written to govern airplanes by people with no direct knowledge of the problem of airplane operations. Laws in some states have been unnecessarily restrictive; in some cases almost making aircraft operation impossible. The law makers are not always hostile toward our operations. In most cases they welcome representatives from all parties concerned. In nearly every case, the problem can be solved; the intent of law can be met, without working an undue hardship on anyone, if all parties are represented. If we are going to stay in this business, maintain a reasonable standard of living and continue to provide a good service to our community, we must see that aerial applicator interests *always* are represented in local, state and national affairs.

No individual applicator can effectively represent himself before the law makers against powerful pressure groups. The only way we can effectively present our case is to cooperate with our competitors to insure the future success of our business. Many operators find the thought of having to cooperate with their competitors a revolting one, but most of us have found that, when we got to know our competitor better, he was not such a bad guy after all. He does have other aims in life than trying to starve our wife and kids. He has many of the same problems we have and will work with us to solve them.

Our system of government continues to become more complicated. Many government agencies tell us what we can do and what we cannot do. As in the state, many federal regulations affect our business and more are coming out of Washington (or as one ag-operator put it — out of "Mal-Function Junction") all the time. As in the state, these people in Washington are not familiar with agricultural-aircraft operations. Here are a few examples of why we must have representation in Washington.

For many years the Civil Aeronautics Administration has represented (?) general aviation before the rule makers of the Civil Aeronautics Board. The CAA has now become FAA, Federal Aviation Agency. FAA can represent no one because it is judge *and* the rule making body. General aviation must present its own case—on many issues against the mighty military and the powerful air carriers. We must not only present the case for general aviation, but for agricultural aviation. We must see that the new FAA recognizes that agricultural-aviation is a distinct and

Problems Of Aerial Applicators

separate part of general aviation with many separate and unique problems. FAA has a big job with many big problems. With pressures from Congress, the billion dollar military and the multi-million dollar air lines, aerial applicators will have to work hard to be heard at all. A stronger National Aviation Trades Association is our best bet.

Federal tax law provides non-highway users of motor fuel an exemption from all or part of the federal gasoline tax. Aviation is entitled to a 1¢ refund and agriculture entitled to a 3¢ refund. Since our business is both aviation and agriculture, it would seem we should be included in either category. Instead many operators have been excluded from both categories. We pay the tax and do not use the fuel on the highway, but cannot get the refund.

We have been told the farmer can claim this tax refund, thereby getting refund of tax money he did not even pay. This is not the way the law was intended. It is an unfair interpretation. Gaining a favorable interpretation from the Internal Revenue Service would be a big undertaking for the individual operator, but is the type problem best and most effectively handled by your trade association.

Another government agency that affects your business is the Wage-Hour branch of the Department of Labor. They have declared that our business is *not* agricultural, that we are *not* a retail service business and that we *are* engaged in interstate commerce. Under this interpretation, we are subject to the minimum wage and overtime provisions. These positions are debatable. Many operators feel that since we are directly agricultural, we should be exempt from these provisions as are all agricultural or retail service establishments. To present this case effectively and carry it to an acceptable decision will be a tough and expensive job; a job for a powerful organization of aerial applicators—National Aviation Trades Association.

Do you feel obligated to foot the bill for the maintenance of the federal airway system with airplanes that operate entirely on the farm and never require the facilities of the system? The new proposed federal aviation gas tax will add 1½¢ per gallon for this purpose. This represents many of our hard earned dollars. We must point out to the people responsible for writing this new tax law the difference between agricultural-aviation and general aviation. Again National Aviation Trades Association is the logical and most capable organization to do the job.

For years we have operated our business under a waiver of civil air regulations; the same waiver used for exhibition or "stunt" flying. We have not been recognized by the government's aviation agency as a unique and highly necessary part of the general aviation picture. Our maintenance regulations were originally written for passenger carrying airplanes. Our weather minimum regulations were written for areas of heavy air traffic and not isolated, single aircraft, farm operation. The government has never given us a definition of its term "congested area."

The agricultural branch of the National Aviation Trades Association is sponsoring a proposed set of regulations designed especially for operation and maintenance of agricultural aircraft. The waiver would be eliminated. We would not be faced by several interpretations of the same law. This proposal, Part 75 of Civil Air Regulations, also provides for an Advisory Council of Agricultural Operators to the government's rule making authority. We would be in a position to advise the Administrator who makes the rules that govern us. If this proposal is accepted by FAA, our industry will be recognized officially by the government's aviation agency. This step will put us in a better legal position, it will improve many of our public relations problems by taking us out of the "air show" category, it will improve our position with the financial institutions and should eventually improve our insurance rates.

In addition to working with government, there are several other very important jobs that can only be done by a strong organization of ag-operators on a national scale.

Our insurance rates are too high. Insurance companies still class us with the air shows mainly because of our "waiver" type op-

(*Continued on Page* 116)

New Developments in Brush Control

by R. L. Gantz
University of Illinois

UNTIL recent years, mechanical methods were the only effective means of controlling brush. This method, however, was expensive, discouraging extensive brush control programs.

The introduction of 2,4-D and 2,4,5-T, changed this situation, but the use of these materials was still somewhat limited because of the hazards caused by drift.

Two trials in Illinois this past year with 2,4-D and 2,4,5-T in invert emulsion type sprays have proven quite promising in controlling drift. In these formulations, the water is dispersed as tiny droplets in oil. The oil makes up about 15 per cent of the spray. When mixed properly, the result is a thick, creamy preparation that can be sprayed with no drift problem.

In one demonstration, a road bordered by tomato fields on both sides was sprayed with Inverton 245, an invert formulation of 2,4,5-T made by the Dow Chemical Co. Even though a cross-wind was blowing at 15 to 20 mph at the time of application, no tomato damage was detected. In the other demonstration, weed and brush control with an invert of 2,4-D made by the Am Chem Products Co. was compared with control by a conventional low-volatile ester. The results indicated that the invert was equally as effective as the ordinary ester on a wide variety of species.

Invert formulations of 2,4-D and 2,4,5-T are not expected to be useable in growing crops. The oil contained in the spray mixture causes too much contact burn.

Since the thick invert sprays apparently can be "piled on" and reportedly will resist washing off by heavy rains, their use as basal treatments on brush may become popular. These sprays, however, present several problems that need further attention. Various aspects of application (such as handling the oil, mixing, and suitable spraying systems) may be troublesome when a considerable amount of spraying is anticipated. The volatility of these materials also is a point that needs further checking.

Another new material, fenuron, is available in pelleted form for controlling brush in fencerows, utility, and railroad rights-of-way, and other non-cultivated areas. It is one of the urea materials that acts as a soil sterilant. The fact that it is available in pelleted form appears to offer some advantages.

Besides being non-corrosive and non-volatile, the pellets can be applied easily by hand as well as by ground and air equipment. They are convenient to use for spot treatment and also have certain advantages in broadcast applications. Absolutely even distribution of pellets reportedly is not necessary for good brush control.

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Preparing Emulsion Sprays

This review on the preparation and application of emulsion sprays for brush control is an extract of the report by Harry M. Elwell, research agronomist with the Agricultural Research Service and Agronomy Department of Oklahoma State University, Stillwater, Oklahoma. His complete paper is offered in the Processed Series P-317, February, 1959, distributed by the Oklahoma State University. Other discussions on the subject have been mimeographed in the form of the 1959 Southern Weed Conference Proceedings, and the 1959 Texas Aviation Conference Proceedings.

REPORTS from applicators and the analysis of samples collected from several commercial sprayers in 1957-58 showed that a number of problems were being encountered in preparation of herbicide sprays for brush control.

Samples were collected and analyzed by inspectors and analysts of the Oklahoma State Department of Agriculture. The analysts classified the samples which had an acid content of 10 per cent above or below the recommended amount as unsatisfactory. The results of 73 collections made in 1957 showed that 56 per cent were unsatisfactory, 44 per cent being below and 12 percent being above the recommended concentration of herbicides. Of the 254 samples taken in 1958, 13 percent were below and 17 per cent above the recommended concentration.

To further explore this problem, several of the low-volatile ester formulations of 2,4,5-T used by applicators during 1958 were prepared and studied.

In preparation of the experimental sprays, four gallons of 2,4,5-T ester, four gallons of diesel oil and 32 gallons of water were used. Samples were taken separately of herbicide, diesel oil and water as they were mixed and circulated. The 2,4,5-T acid content per gallon was determined by standard analytical procedures.

Results show that low-volatile 2,4,5-T ester when poured into quality diesel oil is well dispersed without much stirring. However, when water was added to the 2,4,5-T diesel oil mixture, the chemical did not disperse uniformly throughout the spray.

The acid content of 2,4,5-T in the top layer of spray was 26 percent higher than that from the bottom layer. A good distribution of the 2,4,5-T resulted from circulating the spray for 5 minutes under 30 pounds pressure. The spray emulsion was then permitted to stand undisturbed for 24 hours. Samples taken, the only disturbance being obtaining them, showed that the 2,4,5-T acid content of the top portion of the spray was 262 percent higher than that from the center and 985 percent greater than that from the bottom layer. As expected, the greater concentration of 2,4,5-T was in the oil phase and had risen to the top. However, with 5 minutes of circulation under 30 pounds pressure, the 2,4,5-T was again equally distributed throughout.

In preparing other test sprays, it was observed that a trace of water in either the herbicide or the diesel oil would not permit their uniform distribution when combined. When 2,4,5-T and diesel oil were mixed, either containing a trace of water, curd-like particles formed. These particles did not readily emulsify when additional water was added. Occasionally a thick, creamy layer would form. However, when mixtures having curd particles or a thick creamy layer were stirred by circulation or mechanical means as water was added, a satisfactory emulsion was produced.

Separation of materials occurred when the 2,4,5-T-diesel oil mixture was allowed to stand for 24 hours. A dark, resinous substance formed at the bottom of the mixture. Considerable difficulty was encountered in getting this resinous layer to disperse uniformly. This same type of layering occurred for all of the herbicides tested.

Difficulty also was encountered in preparing good emulsions when the diesel oil contained some resins and rust. The same was true when the water contained considerable calcium carbonates, magnesium sulfates, dispersed clay particles, or organic matter.

Oil in Water Emulsion Sprays

A knowledge of the characteristics of 2,4,5-T formulations is essential to the efficient control of undesired woody plants. Some formulations used in Oklahoma during 1957-1958 formed a fairly stable emulsion, while others remained in an emulsified condition for only a short period. The formulations that separate easily require almost constant stirring to maintain a good distribution of 2,4,5-T in the spray. Generally, the esters are the only formulations of 2,4,5-T that can be mixed with diesel oil and then water.

An emulsion spray with 2,4,5-T ester, diesel oil and water should be mixed as follows: Mix the herbicide and diesel oil together. The 2,4,5-T ester will generally disperse in the diesel oil when the two

(Continued on Page 117)

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Fuel	34 gal.
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Hopper capacity	29 cu. ft. (217 gal.)
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Take off distance @ 3700 lb.	750 ft.
Rate of climb @ 3700 lb.	500 fpm

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Chemical Desiccation Of Seeded Legumes

by W. A. Westgate
Standard Agricultural Chemicals, Inc.

THE use of the dinitro materials, Sinox General, Contax, Dow General or similar products for the chemical desiccation of small seeded legumes has increased greatly during the past ten years. During 1948, only a few acres of seed alfalfa, which constituted a very small percentage of the crop, were treated in California. In 1957, it was reported that more than 75 per cent of the alfalfa seed crop in that State was chemically treated. Added to this, about 25 per cent of the ladino and red clover were treated. The practice is gaining acceptance in other states. Utah has a large acreage being chemically dried, as does Montana.

The method consists of applying one quart of the oil-soluble dinitro chemical (which has for its active ingredient dinitro-ortho- secondary butylphenol or DNBP) in 10 or 15 gallons of diesel fuel or weed oil per acre from an airplane. In three to five days, the crop is ready for harvest using a combine while it is still standing. The dinitro-oil combination produces a quick drying of the leaves, stems and pods, with no adverse effect upon the stand and no reduction in the viability of the harvested seed. Being a highly effective drying agent in quite small amounts, the dinitro compound lends itself as a convenient fortifier for oil, thus providing the additional benefit of low volume spraying. The cost to the grower is very reasonable, comparing favorably with the cost of swathing. Use of the dinitro in most cases offers distinct advantages over swathing and/or windrowing.

One of the principal reasons for chemical drying is the increase in the amount of harvested seed. The increase is possible because excessive shattering is avoided. This is particularly true in areas of low humidity, such as parts of the far western states. Spray curing makes it possible to accomplish the harvesting operation in less than half the time required for cutting and windrowing. However, if the harvest is delayed, the treated crop will pass beyond the optimum stage for seed removal and high losses may result from shattering or rain. While chemically dried alfalfa is not immune to wind damage, it is more tolerant of wind and the losses are much lower than in the case of an untreated crop. Luther G. Jones, an agronomist from the University of California, has reported that in the case of birds foot trefoil, if the crop is allowed to dry normally, the shattering is so severe that seed harvest is very low. The dinitro-oil treatment causes rapid wilting followed by drying and toughening of the plant, which permits harvesting before the pods have dried enough to result in excessive shattering. Where ladino clover is treated and combined directly, a considerable amount of specialized expensive machinery can be eliminated, which allows smaller growers to handle their own harvesting at a much lower cost.

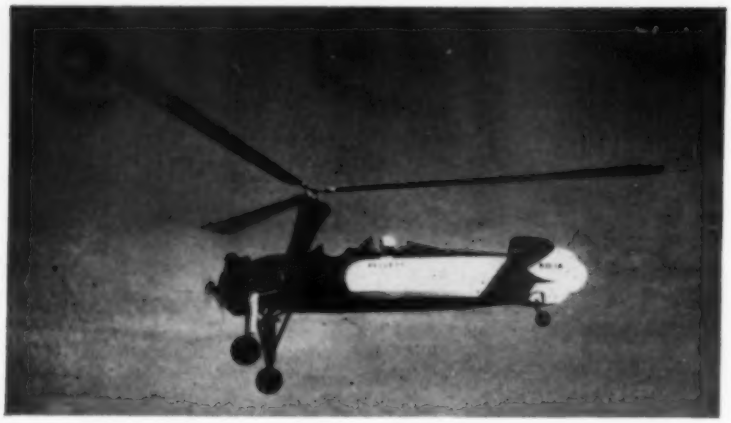
Chemical drying of crops has not found acceptance in areas where plant maturity is not uniform and where the vegetative growth is extremely rank. Such conditions are associated with regions of high rainfall or where heavy irrigation is practiced as the crop approaches maturity.

Optimum results are obtained when the spray is applied on a stand that is open and erect, permitting complete penetration of the spray. On thick and matted stands, two applications may be necessary, the first to kill the external growth and the second, one or two days later, to dry the remainder of the foliage. Timing is very important, there must be close coordination between the spray applicator and the harvesting operation. The treated crop must have sufficient time to dry following the application; on the other hand, too long a delay will result in seed shattering and pod fall with some species and or regrowth in others. The period during which harvesting can be done most successfully following spraying will vary from

(*Continued on Page* 117)

Oil-soluble dinitros are applied by air for the desiccation of small seeded legumes in California. Spray-curing of seed crops facilitates harvest and increases seed yield in areas of low humidity.

Kellett Holds Flight Demonstration of Cropmaster Production Model



KELLETT Aircraft Corp., Willow Grove, Pa., presented a flight demonstration of its autogiro at Willow Grove last month and announced plans to resume production of the craft for sale to agricultural applicators.

Constructed from the original plans of the firm's 1932 autogiro, the craft has been named the "Cropmaster". Following the demonstration, the differences between autogiros, fixed-wing craft, and helicopters were discussed by a panel of Kellett personnel: James T. Duffy Jr., president; Leonard Goland, vice president — research and engineering; George Towson, a veteran autogiro pilot; and Roland Maier, a test pilot.

I. Medgebow, Kellett vice president in charge of sales, said that the autogiro's simplicity of design, construction, and operation will make it immediately useable throughout the world. Initial deliveries are expected by the end of this year. A price of $27,500 F.O.B. Willow Grove, was quoted.

Initial production plans call for a tandem two-seat arrangement which can easily be converted to accomodate a spray tank in the front section. The Cropmaster has a cruising speed of 100 miles per hour and its service ceiling is 14,000 feet.

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Test Spray On Doped Fabric

A study of the effect of various insecticides on the fabric coating of aircraft has been conducted by the Randolph Products Co., Carlstadt, N. J., makers of aircraft and industrial finishes. In the tests, two Randolph materials were used; Standard Butyrate Dope (9105) System and All Purpose Butyrate Dope (9701) System. Chemicals used were Dieldrin W-50, Isotox 25, Ortho Tepp, Malathion 5L, and Parathion 4L.

The first stage of the tests consisted of daily spray applications of the solutions for two weeks to 14-inch-square tests panels, that had been prepared according to the recommended procedures for airplane fabrics. There was no noticeable change in the color and the condition of the dope.

For the second stage of the tests, the concentration of the insecticide solutions was increased to ten per cent and again they were sprayed daily for two weeks without adverse effect on panels. Following this, the panels were placed out of doors after each day's spray treatment for two weeks. While not severe, this exposure did bring about sufficient change in the appearance of the panels to indicate a difference in the behavior of the insecticides toward the coating.

Dieldrin and Isotox had no apparent effect but Ortho Tepp caused a slight color change to a green cast in both dope systems. Malathion caused a very slight color change to light brown in both systems. None of the pesticides, however, affected the fabric tautness and film adhesion.

In summarizing the tests, W. Jean Karl, aircraft finishes sales supervisor for Randolph, said that whatever action these insecticides have on the two coatings tested, there is no indication of impairment to the point of lowering the efficiency in the normal operation of the plane. If a choice is to be made between the two Randolph coatings tested, he said, All Purpose Dope could be favored on the basis of showing a greater degree of resistance to all chemicals to which exposed.

Further tests are being conducted on the effect of chemicals on the underside of the coated fabric which likely would be very susceptible to the action of chemicals released inside the wing or fuselage. Preliminary results indicate that Parathion, Malathion, and Ortho Tepp loosened the doped fabric covering to a degree, but there was no sign of separation of the dope film from the fabric.

New Zealand Conference

Agricultural aircraft operators, manufacturers of agricultural chemicals, and representatives of interested government departments, met in Wanganui, New Zealand, May 26 to 29, for a symposium arranged by the New Zealand Civil Aviation Administration.

The discussions covered operational, technical, and medical problems associated with aerial activities; and developments in agricultural chemicals.

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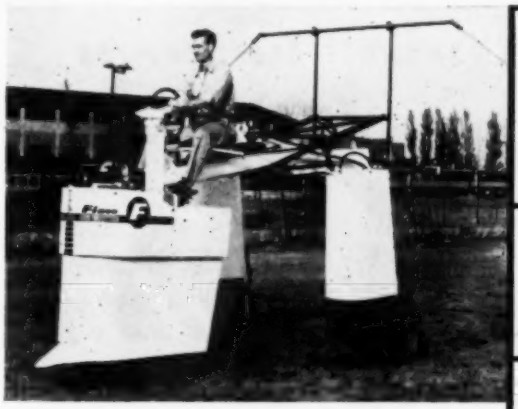

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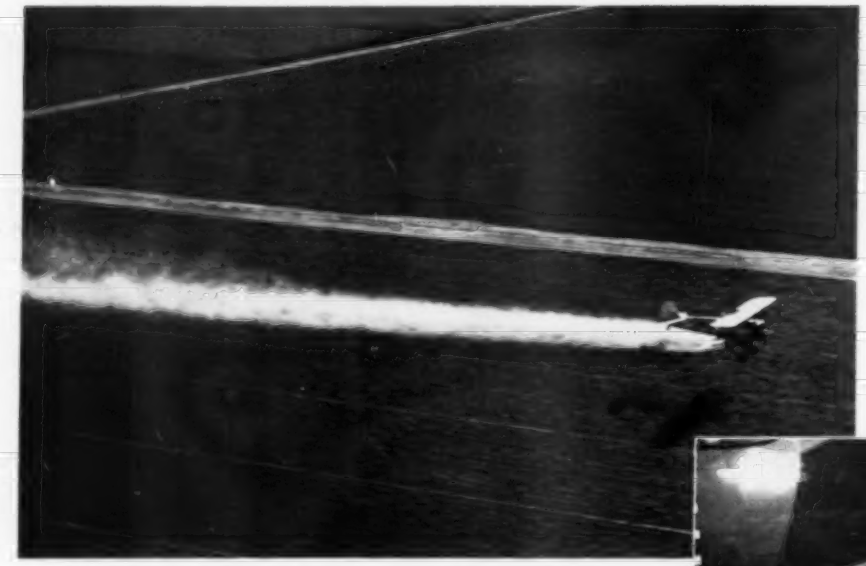

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Scott Turbafog Skid-Mounted Fogging Machine

The Scott Turbafog Co., Auburn, Ind., has developed a skid-mounted fogging machine that consists of a one cylinder, 2 cycle, air-cooled gasoline engine coupled directly to a turbine-type blower. The rocker-type skid permits the fog to be directed up into the trees or down toward the ground, as shown.

The unit is said to provide an even and effective penetration of grass, bushes, shrubbery, trees, and in and around buildings and other areas that may be infested with flies, mosquitoes, or other insect pests.

The fog particle size can be adjusted to 0.5 to 200 microns. Fog velocity is 6,250 feet per minute and the area coverage capacity is 41 acres per hour. The fogging machine accomodates all standard oil-soluble insecticide formulations and will produce either dry or wet fog.

Spray Additive Folder

A folder describing Plyac, a polyethylene spreader-sticker, is being offered by the General Chemical Division of the Allied Chemical Corp., New York. Listed among the advantages to be gained from using Plyac are reduced cost and increased spray effectiveness.

Allied Chemical also is offering a folder on Genite, a miticide that kills plant mites and their eggs in one spray.

•

New Acme Face Mask

The Acme Protection Equipment Co., South Haven, Mich., is offering a mask said to be especially useful in fumigation work.

Four special features are listed for the new mask. They are back mounting of the canister, an adjustable canister pouch that accommodates various sizes of canisters, a quick-change canister connection, and a connection on the face piece that will permit the use of a chin style canister.

International Demonstration

Aircraft manufacturers from Europe and the United States have been invited to take their machines to England in September to fly in the first international exhibition of agricultural aircraft ever to be held. The event will take place on the last day of the first International Agricultural Aviation Conference, which is being held at Cranfield, Bedfordshire, September 14 to 18.

The program will include a demonstration by ten different types of aircraft of the various techniques now in use for agricultural purposes, using both atomizers and spray bars. In addition, there will be an exhibition of turning speed in the form of a timed competition. Since the demonstration is to take place on an air field, more difficult "in the field" conditions will be simulated by artificial obstacles. Efficiency of spraying will be checked with aluminum test strips.

The demonstration, which is open to the public, is to be accompanied by a covered exhibition of appliances, materials, and services associated with aerial application.

The aviation conference, sponsored by the European Agricultural Aviation Center, will consist of three full days for papers and discussions, preceding the flying demonstrations. Among the topics to be discussed is the short season of regular work for aerial applicators in England and the possibilities of extending it.

It is expected that up to 250 delegates will be attending the conference, including about 100 from O.E.E.C. member countries.

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PEST ROUNDUP

By Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head — Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U.S.

Cereal and Forage Insects Active

THE greenbug was very active on small grains in parts of Oklahoma during early April and controls were necessary on large acreages. A mid-April survey of 1,361 small grain fields in 13 north central, northwestern and panhandle Oklahoma counties showed the percentage of fields with visible damage, by counties, to range from 0 to 40. Payne County had 40 percent of the grain fields showing damage, Noble 19 and Kay 14. By the latter part of April treatment was on the decline and in certain areas fields treated earlier this year were recovering. Predators and parasites were also on the buildup.

Parts of Texas also experienced trouble from the greenbug during April. Populations in Brazos and Burleson Counties of central Texas were sufficient to require control measures. In the Dallas-Ft. Worth area and in Foard and Knox Counties beneficial insects were present in sufficient numbers to be of value. In some of the panhandle counties insecticidal treatments continued to be necessary during the month.

In Barber County, Kansas, the greenbug was damaging barley and a mid-April survey of 6 south central, 5 southwestern and 2 southeastern counties showed populations ranging from 0-300 per linear foot. The largest populations were in Cowley and Sumner Counties, but generally less than 10 per linear foot. Populations were increasing rapidly in southwest Missouri by the last of April. Counts of 2-150 per linear foot in wheat and 20-300 in barley were recorded. Heavy infestations of the greenbug resulted in some spotted kills of orchardgrass stands in Lawrence and Green Counties, Missouri. In some of the more heavily infested counties plantings of orchardgrass were being treated.

Although some injury from the greenbug had been reported from Arkansas, populations were generally light. The same was true for Louisiana. Heavier populations reported earlier from Alabama were decreasing.

The pea aphid continued to be a troublesome pest in several areas of the Nation during April. Heavy infestations on vetch were reported from areas of Placer and Siskiyou Counties, California. Controls were necessary on fields of alfalfa in Douglas County, Nevada, and damage was reported from Washington County, Utah. Pea aphids were heavy on alfalfa throughout Arizona, but by the last of April were on the decline in eastern New Mexico. Populations were increasing in Kansas, with alfalfa being damaged in Montgomery and Riley Counties. The aphid was increasing rapidly in red clover and alfalfa in southwestern Missouri, with counts up to 200 per sweep. Some light damage on red clover was apparent by late April.

Pea aphids were present in large numbers on alfalfa throughout Arkansas, with counts up to 100 per sweep. Counts of 26 per 100 sweeps were recorded from clover in White County, Illinois. Counts were also light in Virginia, with the exception of Pittsylvania County where they were recorded as severe. Pennsylvania, Delaware and Maryland reported the insect as common but light.

The spotted alfalfa aphid caused damage in the Southwestern part of the country during April. Heavy infestations were recorded in Guadaulupe County, New Mexico, and plants were being killed in the Hollis and Shattuck areas of Oklahoma. The insect was causing some injury in local areas of Utah, and heavy populations were reported from Washoe County, Nevada.

Alfalfa weevil adults were common on roadside alfalfa at Clarkston, Washington. Alfalfa weevil activity in the west was also reported from Idaho, Wyoming and Colorado, where control was necessary in Garfield, Mesa and Montrose Counties. In the eastern part of the United States activity was reported from Georgia north to Massachusetts, with heavy damage occurring in Georgia, South Carolina and Virginia on untreated alfalfa.

Grasshoppers were hatching in April in various western states. First-instar nymphs were observed in mid-April on rangeland and field margins in some Texas Panhandle Counties. Light populations were recorded in New Mexico as far north as the northeastern part of the State, and in Oklahoma light nymphal populations, heaviest being one per square yard, were found as far north as Beckham County. In areas of Baca and Las ·

(Continued on Page 119)

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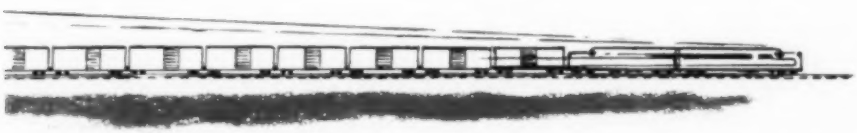

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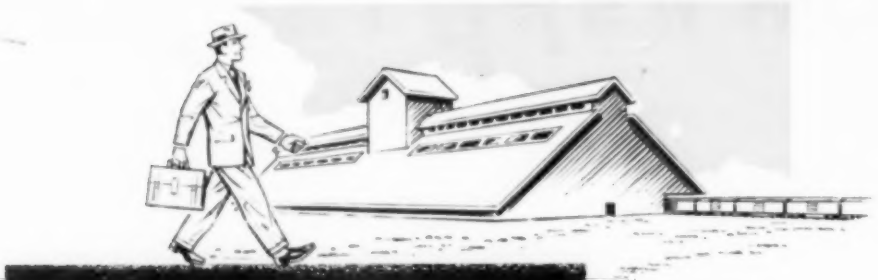

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LISTENING POST

By Paul Miller

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Mycology and Plant Disease Reporting Section, Plant Protection Research Branch, United States Department of Agriculture, Beltsville, Maryland.

Control of Leaf Blotch & Victoria Blight of Oats by Seed Treatment

TWO seed-borne fungus pathogens were associated with unusually low yields of oats at many places in Mississippi during the past two seasons, and were also unusually prevalent in samples of grain from ripening fields, according to S. S. Ivanoff*. These two fungi were *Helminthosporium victoriae*, which causes Victoria blight, and *Helminthosporium* (*Pyrenophora*) *avenae*, the cause of leaf blotch.

Resistant varieties are commonly planted to control Victoria blight. On the other hand not much consideration has been given to the control of leaf blotch, since, except for scattered reports of significant losses, it has generally been thought of as not very important. In the fall of 1957 and again in 1958, however, leaf blotch destroyed many fields of young oats in Mississippi. In fields less severely affected, the quality of the grain was lowered. All the oat varieties grown commercially in the area, including the Victoria blight -resistant varieties, were attacked by leaf blotch.

Dr. Ivanoff states that although the outbreak could be explained entirely on the basis of the unusually favorable weather conditions, other factors might have contributed to it. Possibly more virulent strains of the fungus (*H. avenae*) have appeared, or perhaps seed stocks have become increasingly contaminated from year to year.

Whatever the reason for the epidemic occurrence of leaf blotch in Mississippi, its economic effects were severe enough to make the development of control measures urgently necessary. To that end, preliminary laboratory tests were conducted to determine the effectiveness of treating locally grown, naturally infested seed with a fungicidal dust.

For comparison, chemical control of Victoria blight also was included in the experiments.

Four lots of seed were used for the tests. Lot 1 was seed of the Victoria blight - resistant variety Bronco; it was free from the Victoria blight fungus, but was contaminated very heavily with the leaf blotch organism, *H. avenae*. Lot 2 was of the variety Victorgrain 48-93 and was very badly contaminated with the Victoria blight fungus, *H. victoriae*. Healthy seed stocks of Victorgrain 48-93, and Delair constituted Lots 3 4, respectively; these two lots were used as checks.

Ceresan M (active ingredient ethyl mercury p-toluene sulfonanilide 7.7 percent; total mercury as metallic mercury 3.2 percent, manufacturer's specifications) was used for seed treatment, at the recommended commercial rate of ½ ounce per bushel.

Under laboratory conditions most favorable for the development of leaf blotch, seed treatment controlled the disease completely, whereas in the untreated checks, infection amounted to as much as 66 percent. In small replicated trials in the field, the treated seed produced a healthy stand. A small amount of leaf blotch that appeared as the plants were maturing was probably due to air-borne inoculum from neighboring infected fields. Poor stands and unthrifty plants were produced by the untreated seed. The disease appeared early in the untreated plots, and in some cases decreased the yield considerably.

Victoria blight was not so well controlled by seed treatment. Under optimum laboratory conditions for its development, 88 percent of the seedlings from treated seed were affected by this disease, as compared with 99 percent infected plants from untreated seed. In field tests, plots planted with untreated seed were totally destroyed early in the season. These results agree with those of earlier field tests, which showed that seeed treatment would not prevent development of Victoria blight later in the season, especially in fields that had been planted previously to susceptible oat varieties.★★

*S. S. Ivanoff, "Comparative effects of chemical seed treatment on the control of two Helminthosporium diseases of oats: leaf blotch (Pyrenophora avenae) and Victoria blight (H. victoriae)", *Plant Disease Reporter*, vol. 43, no. 2, pages 180-183, Feb. 15, 1959.

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Physical Properties Booklet

The 1959 edition of the comprehensive booklet, "Physical Properties of Synthetic Organic Chemicals," is being offered by the chemicals department of Union Carbide International Co., Division of Union Carbide Corp., New York.

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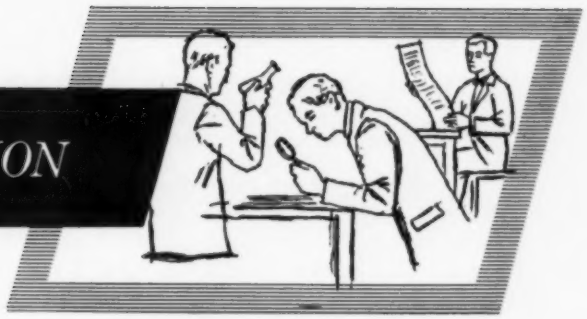

Potato Insect Investigations

By R. N. Hofmaster*

IRISH potato insect investigations are a very important part of the entomological program at the Virginia Truck Experiment Station on the Eastern Shore of Virginia. These investigations have been along three main lines: (1) The use of soil insecticides as a means of controlling both underground pests and foliage feeders; (2) The study of Irish potato insect infestations and potato varietal relationships; and (3) Screening trials with new insecticides against foliage pests of the potato. The present discussion is limited to the foliage screening trials.

Since the advent of DDT and other new high-powered insecticides, we have been plagued by an ever-increasing problem of insects developing resistance. In the general pattern of insect resistance, all the insects in a given area do not usually become resistant to an insecticide simultaneously. Lack of insecticidal control due to resistance is more or less a gradual process in which those insects able to survive treatment and reproduce, (resistant strain) eventually increase and largely replace those susceptible to the insecticide. Once a species of insect becomes resistant to a particular insecticide, it may become harder to kill with other insecticides. This has been clearly demonstrated in the case of the common housefly.

Previous investigations at the Virginia Truck Station have demonstrated that both the potato flea beetle and Colorado potato beetle are resistant to DDT. As a result, dieldrin, heptachlor and aldrin, which are effective against both pests, have largely replaced DDT. However, these chemicals are not very effective against the potato leaf hopper and must be supplemented with parathion, diazinon, DDT, or some other insecticide when leaf hoppers are a problem.

During the past three years, a total of 33 different chemicals have been tested in a variety of rates and formulations against the potato beetle, flea beetle, and leaf hopper. This screening program has had two main objectives: (1) To have alternative insecticides ready for use, if and when potato beetles and flea beetles become resistant to dieldrin, heptachlor or aldrin; and (2) To find a single insecticide which will control all foliage pests — leaf hoppers and aphids included.

Thiodan, A New Insecticide, Shows Promise

Although dieldrin and heptachlor gave adequate commercial control of the flea beetle in 1958, their performance was not as spectacular as in the past. As indicated in Table 1, thiodan, a hetrocyclic sulfur compound, was the most effective insecticide tested

Table 1. Control of Potato Flea Beetle with Foliage Sprays Exmore, Virginia, 1958

Treatment	Quarts Emulsion per/A. per application	Lbs. Actual/A. per application	Flea Beetle Scars on Potato Foliage June 26 Number	July 3 Number	July 3 % Reduction
DDT	1.0	0.5	104	402	66
Heptachlor	1.0	0.5	80	241	79
Parathion-Dieldrin	0.5, 0.5	0.25, 0.2	40	174	85
Thiodan	1.0	0.5	43	111	91
Thiodan	1.5	0.75	29	76	93
Check	—	—	785	1165	—

1/ Treated June 4, 10, 16, 23.

Table 2. Control of the Potato Leaf Hopper with Foliage Sprays Painter, Virginia, 1958

Treatment	Quarts Emulsion per/A. per application	Lbs. Actual/A. per application	Leaf Hopper Nymphs on Potato Foliage Number	% Reduction	Yield in Lbs. No. 1 Potatoes
DDT	1.0	0.5	21	84	119
Thiodan	1.0	0.5	3	98	133
Thiodan	1.5	0.75	2	99	145
Check	—	—	130	—	91

1/ Treated June 4, 10, 16, 23.

*This report on potato insect investigations appeared in March, 1959 edition *Vegetable Growers News*, publication of the Virginia Truck Experiment Station, Norfolk, Va.

"Gentlemen...the new C+I spherodizer process can pelletize both solutions and slurries*"

* **Ammonium Nitrate Phosphate**
(26-26-0)

Ammonium Phosphate
(21-53-0)

Ammonium Nitrate
(from 83% solution)

Urea
(from 70% solution)

Complex Fertilizer
(all ratios and grades)

Ammonium Sulphate

Ammonium Nitrate Limestone

C&I's new SPHERODIZER PROCESS† can pelletize solutions and slurries for the production of high analysis fertilizer without utilizing prilling or other costly granulating methods. Outstanding advantages of the Spherodizer Process are: comparatively low capital investment in plant; a recycle rate less than 20%; exceptional flexibility in that the process can spherodize any slurry and low concentrated solutions. The Spherodizer Process produces a uniform, homogenous, and symmetrical pellet in any desired size range that can be stored in bulk or bags. Plants are available in any desired capacity.

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†*Pat. applied for*

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against the potato flea beetle. In another test, (Table 2) thiodan was outstanding against the potato leaf hopper and produced significantly higher yields than DDT. Thiodan has also given excellent results on the potato beetle and potato aphid.

Thiodan has been cleared for use as a foliage spray on potatoes. Application should be at the rate of 1 quart 25 per cent emulsion or 25-30 pounds of a 4 per cent dust. Observe the safety precautions on the label.

The following chemicals have shown promise as foliage sprays in controlling potato pests but have not been cleared for use as yet: sevin, guthion, kepone, and dibrom.

•

Handling Phosphoric Acid

A booklet on the handling and storage of phosphoric acid is offered as Technical Bulletin No. VI-58, by Victor Chemical Works, Chicago. Information contained refers to the bulk shipping, handling, and storage of the acid.

Bulk shipments are supplied in tank car and tank truck quantities of 2,000 (for truck), 4,000, 6,000 and 8,000 gallons by rail. Both types of carriers may be unloaded by either compressed air or pump. Conditions limiting the use of air pressure for unloading are the length of pipe leading from the tank car to the storage tank and the unloading head. (Equipment recommended and instructions for unloading tank cars by compressed air are given in Manufacturing Chemists' Association Manual Sheet TC-2.)

Unloading lines may be constructed of type 316 stainless steel, rubber-lined, or certain grades of plastic lined pipe. It is pointed out that storage tanks for phosphoric acid are generally economical to fabricate from solid stainless steel, unless there are unusual pressure conditions. It is suggested that the use of stainless clad be limited to tanks requiring a plate thickness on the order of ½", which with 20% cladding will result in a stainless steel thickness of only .10". Tanks having a capacity of 6,000 to 10,000 gallons can normally be fabricated with a 3/16" thick bottom and No. 11 gauge sides and tops.

In so far as safety precautions are concerned, it is noted that phosphoric acid is not subject to the same regulations of packaging and shipping as the more hazardous acids, such as hydrochloric, sulfuric, etc. Precautions observed for unloading and handling phosphoric acid are the same as for handling all mineral acids. Gauntlet rubber gloves and close fitting goggles should be worn throughout the unloading operation.

Phosphoric acid will decompose conventional clothing, but its effect is greatest on cotton fabrics and only to a lesser degree, on wool and certain synthetics.

Reports on Soil Testing, Nematocides Highlight Florida Meeting

AT the second annual short course for members of the Florida foilage growing industry, held recently in Miami, discussions centered on soil testing, nutrition, and pest control.

Dr. Granville C. Horn, Soils Specialist from the Florida Agricultural Extension Service, explained the use and interpretation of soil tests. He described tools and methods for obtaining a good sample of soil, and reviewed the significance of pH values of a soil.

Charts showing the reaction of various nutrients under different pH conditions were used to illustrate the value of soil tests in order to gain the maximum benefit from application of soil nutrients.

The importance of disease control was stressed by Dr. Lorne McFadden, assistant ornamental horticulturist at the Sub-Tropical Experiment Station, Homestead, Florida. He said "In order to bring the highest profitable returns to the foliage plant grower and at the same time offer the public the best in foliage plants, every effort should be made to produce and market only healthy disease-free plants."

Using actual samples of diseased plants, Dr. McFadden told how to recognize various diseases, and how they are caused and spread. He recommended the use of a tri-basic copper sulfate spray to control most fungus diseases attacking leaf and stem parts of foliage plants. For control of bacterial diseases, it was suggested that rooting stock, which most nurserymen are already dipping in a fungicide, also be treated by adding Agri-Mycin to the dip.

Dr. R. S. Mullin, plant pathologist, Florida Agricultural Extension Service, spoke on methods of soil treatment to control nematodes, fungi, bacteria, and other diseases of the root systems. Dr. Mullin said that chemical treatments are most effective but also most difficult to apply. He said tear gas is an excellent larvacide which also kills nematodes and bacteria. This must be injected into the soil and then sealed with water. Cost is about $400 per acre.

Methyl bromide was also recommended as an excellent chemical treatment, particularly for plant beds. Large scale applications of this were said to be difficult, because the soil must be covered with plastic or some similar material during the period of treatment. However, an advantage is that planting may be done right after treatment. Vapam can be applied either through injection or as a drench, but there must be a delay of two weeks or more before planting. Other chemicals recommended for nematode treatment by Dr. Mullin were ethylene dibromide and Nemagon.

Dr. Mullin said that the hot water treatment is the best method

(Continued on Page 130)

The Versatile Fungicide

Is there another **Fungicide** offering these advantages?

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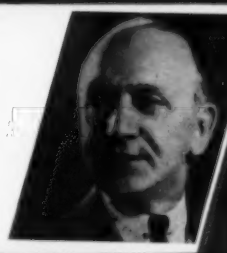
Fertilizer Views and News



By Vincent Sauchelli

Dr. Sauchelli is Chemical Technologist for National Plant Food Institute.

Testing the Organic Theory: The Haughley Experiment

WHAT is there about soil organic matter in relation to crop growth that makes it a perennial argument? Why can't the scientists give definitive answers that will convince the advocates of the peasant's manure pile their contentions ignore the modern facts of plant growth. One answer is, perhaps, that a man convinced against his will is of the same opinion still. In Haughley, Suffolk County, England, the organic advocates started an experiment about a decade ago to demonstrate the soundness of their claims. Lady Eve Balfour and Miss Alice Debenham, two famous leaders of the "organic school", determined to do something about this question. They put their neighboring farms in trust for the purpose of comparing on a long-term, scientific basis the so-called organic and chemical methods of farming, and to demonstrate that crops grown with organics only were more nutritious than chemically fertilized harvests. The experiment has been conducted by a group called The Soil Association.

Their decision to provide these farms was undoubtedly fostered by the support of medical enthusiasts in the organic method of farming. For example, early in 1949 about 600 medical practitioners in Great Britain signed a sort of "medical testament" calling for research on the soil-plant-animal-man relationship, and for greater support of existent, voluntary research. Again, in 1957, almost twenty years later, 230 physicians and 170 dentists in Great Britain issued a new declaration, in many respects similar to the 1939 statement. One British critic* discussing these statements has pointed out that both statements showed an absence of (1) evidence relating human health disorders to systems of soil or crop nutrition and (2) absence of cogent reasons why a national research project should be authorized to investigate relationships between soil fertility and health.

In 1952, the experimental project at Haughley was put under the direction of a recognized authority in biology, Dr. R. F. Milton. This action encouraged the hope that the project would, in time, produce measured evidence of the validity of any findings. Up to the appointment of Dr. Milton the project was criticized on the basis that the experiments, as being conducted, were incapable of producing conclusive results, since the plot work was not carried out in duplicate or triplicate, and could therefore not be analyzed by statistical techniques.

Over-enthusiasm leading to over-statement and sharp attacks on differing viewpoints have all too frequently characterized this perennial controversy on the merits of organic and chemical methods of fertilization. The annual reports of The Soil Association on the project at Haughley have shown restraint and more objectivity. Dr. Milton has emphasized that the object of the experiments is to get information on the respective merits of the two types of farming, with special reference to "the quality" in foodstuffs in addition to "the quantity." The evaluation of quality is not simple, because it is not possible to define it. Chemical as well as biological assays are required — "quality" must be tested with animals and with humans.

Most scientists are frank to say they do not yet know the true significance of organic matter in the soil. This is one of the most challenging questions in agriculture and in nutrition. In the U. S., and also in many other advanced countries of the world, the question of soil organic matter in its possible nutritional relationships is being investigated vigorously. The experiments at Haughley should help resolve many facets of the controversy, and for many reasons this unique research project deserves support and careful appraisal. Up to this year, the findings at Haughley do not prove or indicate that chemical fertilizers need not be used in farming. They show favorable results with organics as well as chemicals.

The modern concept of fertilizers is that they are used to correct deficiencies that limit crop yields. Agronomists everywhere have convincingly shown that each increment of the right kind of fertilizer produces an increase in yield until the deficit has been fully corrected, at which time no further increase in yield occurs, with an increase in fertilizer applications. This concept is based on the principle that no plant nutrients should be applied if they are already present in sufficient amounts to produce a normal, maximum yield per acre. It is not the purpose to produce an abnormally in-

(*Continued on Page* 122)

*D. P. Hopkins, author and chemist.

Better fertilizers begin with three grades of free-flowing USP potash

USP offers *three* outstanding grades of potash to meet the most exacting requirements of modern fertilizer production: two white grades—Higrade muriate and Higrade Granular muriate—each containing 62/63% K_2O give you more potash per ton than any other type of muriate. And USP's Granular muriate, containing 60% K_2O, is preferred where a still larger particle size is required.

All three grades are specially refined to remain free-flowing and resist caking for easier handling, manufacture and application.

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WASHINGTON REPORT

By Donald Lerch

FERTILIZER manufacturers attending the National Plant Food Institute's Fourth Annual Convention at the Greenbrier will be in for a real eye-opener when NPFI staff presents its "progress report."

The Institute's intensified soil fertility program has been in operation for its first full year. Results indicate a boom in fertilizer sales in every area where the program has been started.

The six Georgia counties where the program was begun showed fertilizer consumption up 10.1% in 1958, first period of the program there, over 1957. And this was despite a drop of 1% in fertilizer consumption.

Increases in plant nutrients were even more impressive—27% for nitrogen, 10% for phosphates, and 18% for potash—indicating that farmers in the program area were using more recommended materials. And it paid off! Farm income in the area was up $3.25 M.

In a county in North Carolina, fertilizer consumption was up 14.7%, farm income was up $1.75 million, and all 6,000 farmers in the county had soil samples taken —more than all the soil samples taken in the area during the preceding 15 years.

If NPFI members are wearing broad smiles at the convention, this is understandable. Reports of sales so far this year indicate increases of 20 to 50 per cent in a number of areas of the country. While this may be due, in part, to an early movement of supplies, many feel the increase will stick with them throughout the year. Success of NPFI's increased soil fertility program, now underway in 88 counties, indicates it might.

* * * * *

At a highly interesting meeting during the Second World Health Conference in Washington, top level U. S. health authorities discussed chances of holding an International Health Year.

While the main emphasis would be on health, the year-long activity would have an important impact on pesticide sales and public relations. Though it was not mentioned during the meeting, pesticides contribute to better health in two significant ways—through boosting production of needed foods and through control of disease-carrying pests.

Senator Hubert Humphrey, who may be the Democratic candidate for president in 1960, is carrying the ball for IHY to start, if possible, in June 1961. So if the world-wide effort to improve health is launched, his views can be expected to play a dominant role.

During the Health Conference, Sen. Humphrey made no secret of the fact that he believes that a number of major diseases can be completely eradicated. He said, in fact, that he favors a world-wide drive to eradicate a number of diseases in addition to malaria.

This is a new concept in medicine. Until recently, doctors talked about prevention and cure of disease, just as entomologists have talked about prevention and control of pests. Pesticides success in eradicating malaria in many areas has helped to change both views. Now world health authorities, as well as Sen. Humphrey, are talking about the possibilities of eradicating diseases.

Public relations-wise the entire Pesticide Industry stands to gain from any world-wide campaign by leading health authorities to eradicate diseases, particularly when the use of pesticides plays an important part in eradication of a number of pest-carried diseases.

Members of the Pesticide Industry attending the conference did not miss the reference by at least one authority, Dr. Abraham Horwitz, Director of the Pan American Sanitary Bureau, to the need to boost food production in many areas as an essential move to improve human health. Additional quantities of both pesticides and fertilizers will be needed in the food-producing phase of any world-wide health campaign.

A satisfactory dividend the Pesticide Industry might expect from IHY is in the field of public relations. The International Health Year would focus world-wide attention on improving health through making use of the latest scientific advances. Some Washington observers point out that this can go far in exposing the most outspoken critics of the use of pesticides.

For, these critics are among the cultists and quacks who take every opportunity to discredit legitimate scientific progress to improve health and our food production. They cannot but lose by any program designed to stress the benefits

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Three big reasons: **(1)** You're doing business with a company that has a reputation for giving service to customers. It has been upholding this reputation for seventy years. **(2)** You're buying from representatives who know their responsibilities to their customers and who know from years of experience selling, what problems a user of NH_3 and Nitrogen Solutions has to meet. These representatives know that they can serve a customer best by seeing that their product is delivered when the customer wants it, and that it meets the customer's requirements. **(3)** Standard Oil Anhydrous Ammonia and Nitrogen Solutions are produced in one of the most modern plants in the industry. Supporting this plant is one of the largest quality-control laboratories in the country.

Thus, when you order Anhydrous Ammonia and Nitrogen Solutions from Standard Oil, you know you are buying from a supplier that is reliable. Your representative knows his business and knows how to provide service on deliveries. You're getting quality products from a modern plant that's backed by top quality control and research.

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scientific progress has brought and will continue to bring to human health.

Nothing definite has been done about IHY so far. The U. S. Senate has passed a resolution approving the concept of a year-long worldwide promotion of public health. World Health Organization leaders are talking in terms of doing for public health what the recent International Geophysical Year did for space exploration. Sentiment favoring an IHY is building up on Capitol Hill.

Thus, while the International Health Year is not yet definitely in the cards, it is a development members of the pesticides and fertilizer industries might do well to follow closely.

* * * * *

Aerial applicators received a professional boost when Oklahoma State University, Stillwater, Okla., announced its new agricultural pilot flight training course.

Up to now, training in this field has been limited to short courses. The Oklahoma State course, however, will be part of the University's regular curriculum. This program actually will take a student from the ground up.

The University will use its own aircraft, field and other facilities to train the student to fly, then, how to conduct spraying and dusting operations. There will be instruction on safety precautions with different materials, and also classes on weed and insect problems.

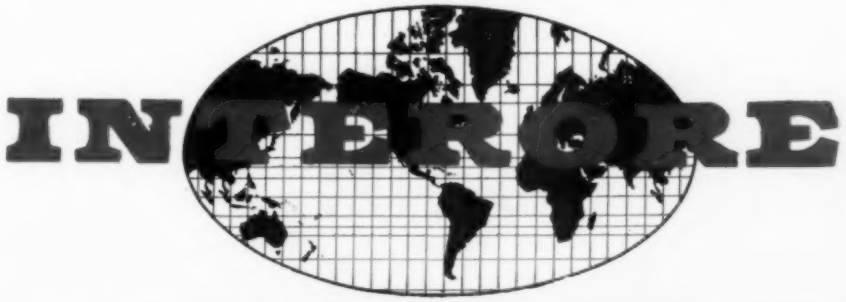
The National Aviation Trades Association and the Federal Aviation Authority are cooperating in setting up the course, and the course requirements, with the hope this will be the first of many similar schools to train future aerial applicators.

All elements for success of the course seem to be stacked in Oklahoma State University's favor. Bob Monroe, of NATA, reports that the University has long had a successful pilot flight course taking students through instrument operation with multi-engine planes, and now has such aerial applicator experts as J. H. Henley, of Alice, Texas, as advisor in setting up a practical training program.

* * * * *

Leaders in the pesticides industry have long realized that the industry's approach to the public must have two sides. One is putting out fires set by rabid anti-chemical groups, which NAC and industry members have been doing for many years. The other is a positive program to tell the public the benefit that proper pesticide use brings to everyone.

Now underway in earnest, the positive public relations approach is now beginning to gain favorable public reaction. "The Open Door To Plenty", released by NAC last October, is now moving to-



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ward its third printing. Already demand for the color slide kit, "Pesticides—Boon To Mankind" is beginning to mount.

The slide kit already has been shown to groups in a number of states, a major showing to home demonstration groups is scheduled this month, and highlights from the kit have been displayed to women attending the annual meeting of the Delaware State Federation of Women's Clubs.

More significant, facts presented objectively in these NAC programs are beginning to be reflected in growing reasonableness of some wildlife conservation groups. This reaction indicates that when facts about pesticides are looked at objectively, people will see that the industry is operating in the best interests of the public.

As an interesting sidelight, NAC's "Open Door to Plenty" recently was distributed at a New York meeting of the Garden Writers Association of America, attended by Bob Rodale of the Organic Gardening and Farming group. Bob countered distribution of the NAC booklet by announcing a 50 per cent discount to Gardent Writers for his group's new "Encyclopedia of Organic Gardening."

* * * * *

USDA officials are pleased at the public reception of their fire ant film, "Fire Ant On Trial." Despite an effort of a few wildlife officials to ban showing of the film, "Fire Ant On Trial" is steadily gaining audiences. The CBS Television Network, for example, recently used portions of the film in a network news broadcast. Meanwhile, evidence of extensive imported fire ant damage to crops, small animals, and some newly hatched birds is continuing to mount, underscoring the need to eradicate the pest. Much of the evidence is being collected by leading naturalists who have no connection with the eradication program.★★

Arcadian® News

Volume 4 | For Manufacturers of Mixed Fertilizers | Number 6

"Thank You!"

"As the rush of the present season ends and preparation for a new fertilizer year begins, all of us here at Nitrogen Division, Allied Chemical, find this an appropriate time to say *'Thank You!'* to our customers. We appreciate your business and trust that you are pleased with our products and our service.

"Every fertilizer year is different—a unique combination of variables. However, one thing in this business is constant—the privilege of building a mutually pleasant and productive relationship with a lot of fine people. We are proud of our customers in the fertilizer industry.

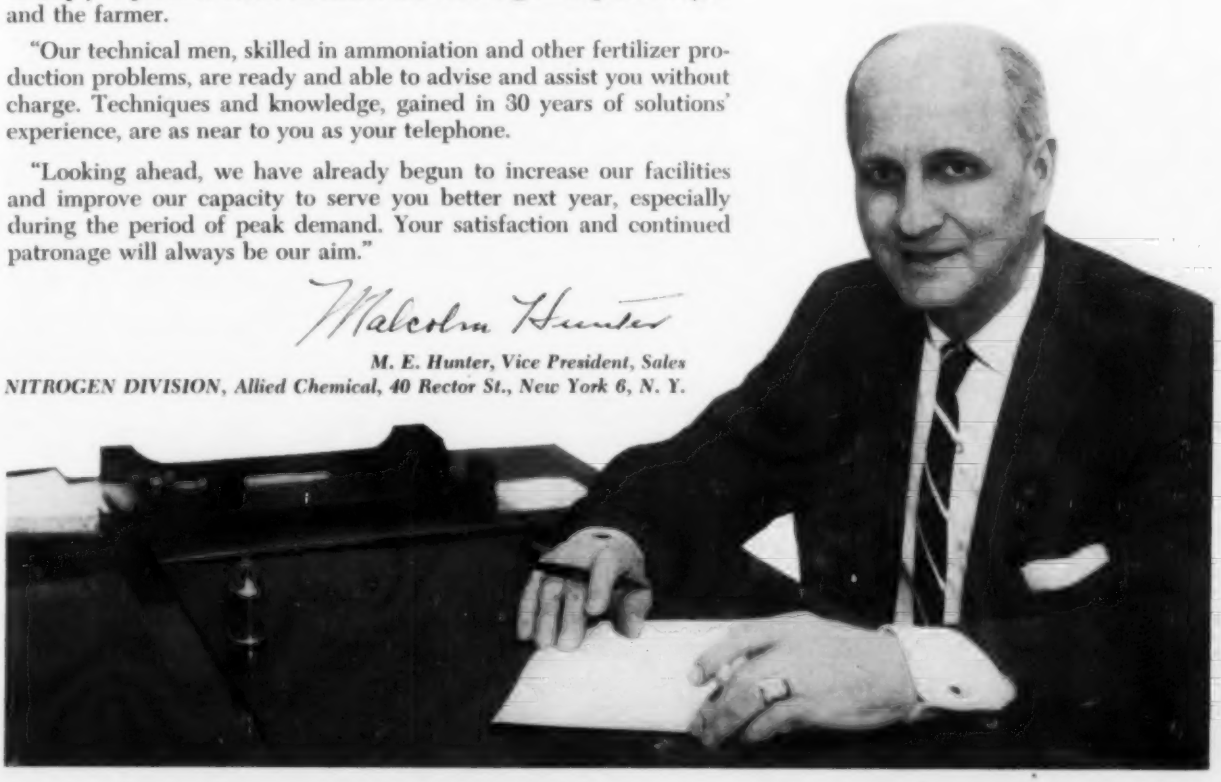
"We strive in many ways to deserve your confidence and your loyalty. We produce for you the most complete line of nitrogen materials for manufacturing fertilizers. The research that originated nitrogen solutions is constantly at work, developing new methods and materials to help you produce better fertilizers that return greater profits to you and the farmer.

"Our technical men, skilled in ammoniation and other fertilizer production problems, are ready and able to advise and assist you without charge. Techniques and knowledge, gained in 30 years of solutions' experience, are as near to you as your telephone.

"Looking ahead, we have already begun to increase our facilities and improve our capacity to serve you better next year, especially during the period of peak demand. Your satisfaction and continued patronage will always be our aim."

Malcolm Hunter

M. E. Hunter, Vice President, Sales
NITROGEN DIVISION, Allied Chemical, 40 Rector St., New York 6, N. Y.



Hot Weather Handling of Nitrogen Solutions

Producers know the many advantages of using ARCADIAN® Nitrogen Solutions for ammoniation. But it's what they *don't* know about handling these solutions that could cause trouble in the hot weather months ahead.

Boiling points of the various nitrogen solutions will differ—depending largely on their percentage of ammonia *(see thermometer chart)*—but they *all* develop relatively high vapor pressures as temperatures rise. Where this happens, serious problems can occur, such as:

Faulty performance of meters, including the simple, reliable measuring tank. Ammonia gas bubbles, present in a liquid, make meters virtually inoperative, causing inaccurate formulation and confused inventory records.

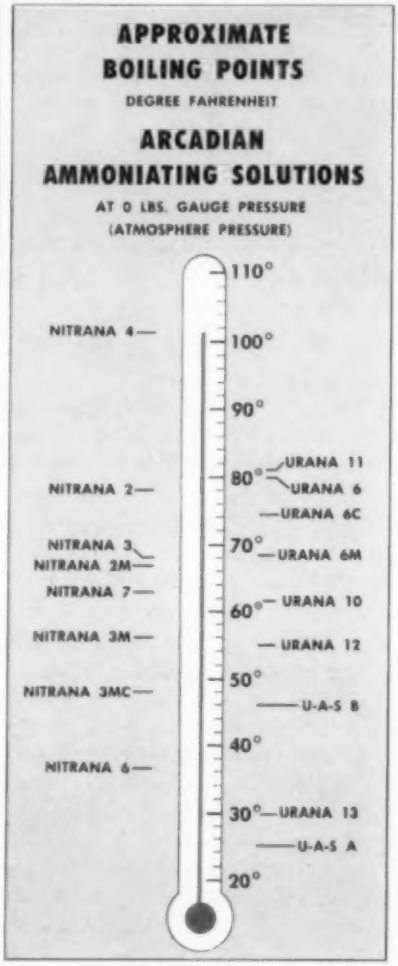
Incomplete unloading of tank cars. Gas bubbles rushing through unloading lines make the same sounds and jumping motion of the hose as caused by the flow of compressed air when the solution has been completely unloaded. This often misleads operators into thinking that unloading is completed, and they return tank cars partially filled.

Excessive fumes during operation. The higher the vapor pressure, the greater the possibilities of trouble from ammonia fumes outside the system and from entrained bubbles inside the system.

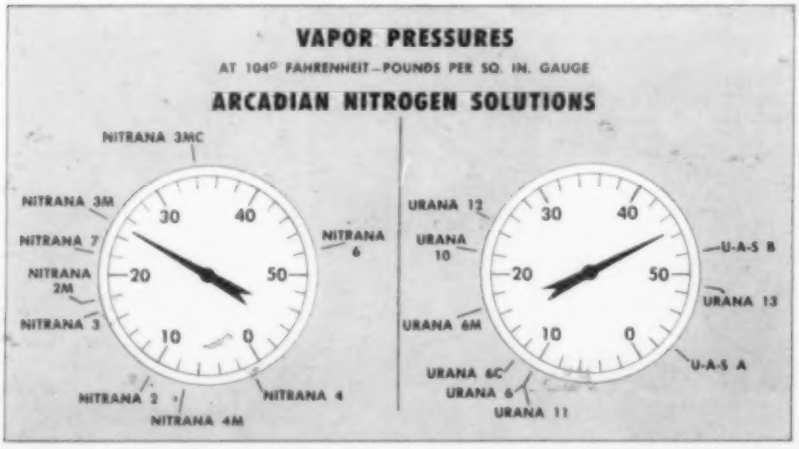
How can the producer tell that excessive vaporization has occurred? In addition to the not-always-reliable practice of "smelling" trouble in heavy fumes, there are accurate visual methods for spotting excessive vaporization. In continuous systems, the alert operator will see tell-tale gas bubbles in the rotometer. In batch systems, the bubbles show in the gauge glass. Where the system uses batch weighing of solution, the experienced operator can detect overly high vapor pressure from the longer period of time it takes to fill the measuring tank.

Excessive vaporization can be minimized to a great extent by taking steps to see that solutions are kept as cool as possible. For example, storage tanks can be shaded from the direct sun. Painting tanks white or aluminum, for heat reflection, also helps. If at all practical, a sprinkler system to spray water on tanks could be installed. In some cases, where the solution is cool when unloaded, insulated tanks would prove valuable.

However, the surest, most effective way to prevent troublesome ammonia gas from forming is to *keep air pressure higher than vapor pressure at all points in the solution handling system.* Of course, the producer must remember that flow resistance in piping and meters can absorb considerable pressure, so that the actual air pressure on the solution at some critical point in the system may be reduced enough to invite troubles from vapor. In fact, the pressure loss in the system could be great enough to permit the release of vapor at some critical point in the system. The wise producer is aware of this and adjusts his air pressure accordingly.



It goes without saying that the producer should check over his equipment and operating procedures *before* putting additional air pressure on his system in hot weather. Tanks and piping should be designed to accommodate the highest anticipated operating pressures. Tanks should be equipped with pressure relief valves to relieve any unexpected pressure build-up. And it is best to have a vacuum relief valve, as well. For where there is a temperature drop, ammonia vapors are reabsorbed by the solution, and a partial vacuum can develop. In hot weather particularly, venting of tanks during transfer of solutions should be held to a minimum, to avoid loss of nitrogen. For more information on hot weather handling of nitrogen solutions in terms of your own operation, contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y.



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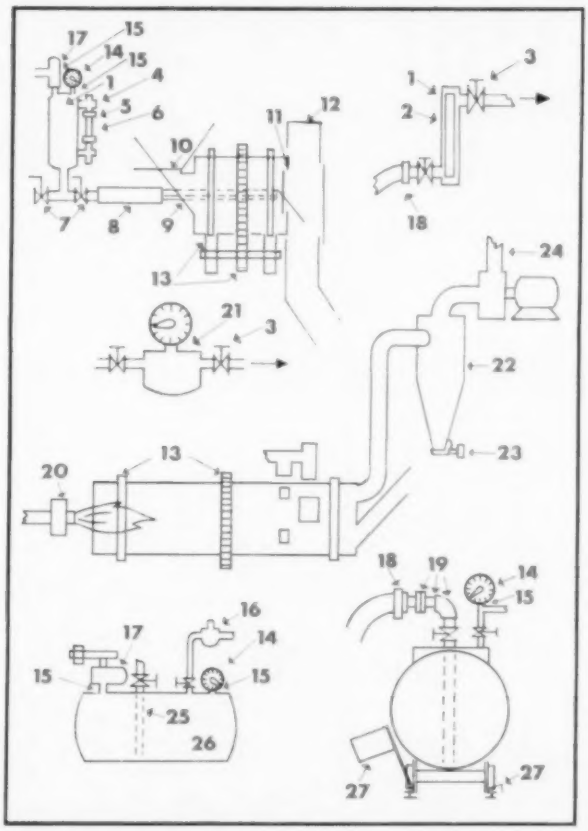
It Pays to Check Your Equipment

Here are some of the points to check to insure safe and efficient operation:

Action Needed	OK	
☐	☐	1 Measuring tanks, rotometers – use correct specific gravities.
☐	☐	2 Rotometer. Check float for wear and corrosion. Shield against breakage. Avoid mechanical strains.
☐	☐	3 Throttle on discharge side – to minimize vaporization of nitrogen solutions.
☐	☐	4 Gauge glass connections – fittings – free for easy cleaning.
☐	☐	5 Extra gaskets for gauge glasses.
☐	☐	6 Clean glass tubes. Make sure you have spare tubes.
☐	☐	7 Valves. Check for wear. Have spare parts on hand.
☐	☐	8 Rubber hose to reduce vibrations.
☐	☐	9 All distributor pipes for design and condition.
☐	☐	10 Mixer inlet gate for leakage.
☐	☐	11 Mixer discharge door for leakage.
☐	☐	12 Rotary batch mixer. Avoid suction in mixer.
☐	☐	13 Tires, trunions, ring gears and pinion for alignment, wear and safeguards.
☐	☐	14 Pressure gauges – for ammonia service? – accurate? Do not let pressure continue to rise. These are not clocks.
☐	☐	15 Location of gauges and safety valves on storage tanks. If connected into or near high velocity air line, they are not accurate during movement of air.
☐	☐	16 Pressure regulators. They are not safety devices.
☐	☐	17 Pressure and vacuum reliefs. Check operations. Remove weights unofficially added.
☐	☐	18 Hose connections. Adequate stainless steel bolted clamps.
☐	☐	19 Tank car connections. Stainless steel and short for strength and permanence. Use elbows to avoid hose kinks.
☐	☐	20 Dryer burner – clean, adjust, and check controls.
☐	☐	21 Displacement meters. Lose accuracy at low rate of flow and with gas bubbles.
☐	☐	22 Dust collector. Check for condensation, caking, deterioration, overloading. Clean fan blades.
☐	☐	23 Check for air leaks at dust collector discharge.
☐	☐	24 Stacks. Check for fouling and corrosion.
☐	☐	25 Storage tank dip pipes. Check for leaks.
☐	☐	26 Tanks. Check for weakening by corrosion, and failure of any coating or lining.
☐	☐	27 Tank cars. Always blue flag and block wheels.



OTHER PRECAUTIONS: Make sure operators have proper training and instruction. Equip them with rubber gloves and goggles. Have good lighting and safe exits. Keep safety literature handy. Have gas masks and a supply of water for emergencies. Emergency shower baths should be freeze-proof and warm for cold weather.

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	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60° F	Approx. Vap. Press. at 104° F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

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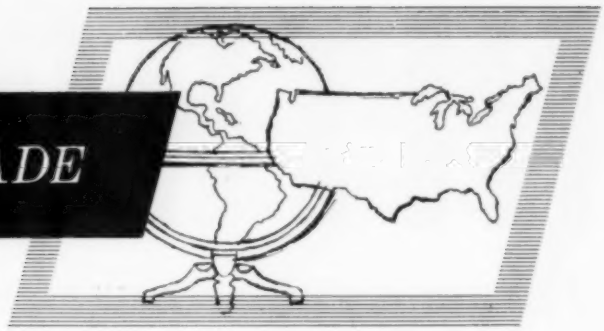

Named Sales Manager

George Klein has been named sales manager, triple superphosphate for the Davison Chemical Division of W. R. Grace & Co., Baltimore, Md.

Mr. Klein, who has been with Davison for 24 years, most recently has been on special sales assignments. From 1944 to 1954, he was manager of the Davison mixed fertilizer plant at Nashville and from 1954 to 1956, he was general sales manager for the mixed fertilizer division.

•

Accident Prevention School

An accident prevention school for personnel of Midwest fertilizer companies will be held at the National Safety Council's Chicago office, August 18 to 19.

•

Offer Pyrethrum Film

A 16 mm, color motion picture about pyrethrum is being offered for viewing by adult groups and colleges by Tribune Films, Inc., New York. Sponsored by the African pyrethrum growers, the film was shot in the pyrethrum-growing areas of the Equatorial Highlands in British East Africa and the Belgian Congo.

The film, titled "The Pyrethrum Story", shows the processes by which the pyrethrum flowers are turned into an insecticide. It is available on free loan from Tribune Films, 141 E. 44th St., New York.

•

Fertilizer Plant Demonstration

The Tennessee Valley Authority will hold a pilot-plant demonstration of fertilizer technology June 9-11 at the Fertilizer-Munitions Development Center, Muscle Shoals, Ala.

Included in the program will be: (1) demonstration of the production of 12-12-12 in the continuous ammoniator and apparatus for estimation of nitrous oxides in effluent gas; (2) demonstration of the use of TVA-produced 30-10-10 in the production of 20-10-10 granular fertilizer; (3) discussion on production of granular no-nitrogen grades and on the production of high-nitrogen grades; (4) demonstration of the production of 0-25-25, using the phosphate rock-phosphoric acid reaction to promote granulation; (5) demonstrations on production of 0-23-23 and 8-24-0 liquid fertilizers; (6) demonstration on pumping and spraying of suspension fertilizers.

Members of the fertilizer industry and other interested persons are invited to attend.

•

CFA Moves To Sacramento

The office of the California Fertilizer Association has been moved from San Marino to Sacramento.

The new address is: Ochsner Building, 719 "K" St., Sacramento.

•

Southwestern Sales Manager

Carl D. Fischer has been appointed Southwestern Regional Sales Manager of Crag Agricultural Chemicals by the Union Carbide Chemicals Co., division of the Union Carbide Corp., New York.

With headquarters at Phoenix, Ariz., Mr. Fischer will be responsible for marketing activities throughout Arizona, New Mexico, West Texas, and Colorado. He had been stationed with the Crag Agricultural Chemicals sales group at White Plains, N. Y.

Lynch Joins Vulcan

Gordon D. Zuck, president of Vulcan Steel Container Co., Birmingham, Ala., recently announced the appointment of David W. Lynch as Sales-Service Representative.

Mr. Lynch has been active for the past 20 years in the sale of basic insecticides and chemicals to the agricultural and household pesticide industries. He was formerly on the sales staff of John Powell & Co. before that firm was purchased by Olin Mathieson. His wide acquaintance in these fields gives him a diversified background of experience.

Vulcan manufactures a line of steel pails and drums in sizes ranging from one through 65 gallons.

•

Sees More Nitrogen Use

A rising standard of living and an increase in population are expected to benefit the nitrogen industry in future years, said Fred O. Agel, vice president, Nitrogen Division, Allied Chemical Co., New York, at the 40th annual meeting of the American Institute of Chemical Engineers at Kansas City, Mo., May 18. Mr. Agel forecast U.S. consumption in 1975 at about six million tons, as compared with 3.1 million tons in 1958 and 1.1 million tons in 1947. He noted, however, that the industry is faced with "an apparent overcapacity" at present of about one million tons each year.

W. H. McConnell and K. S. Lewis of the Diamond Alkali Co., Cleveland, also spoke at the meeting and said that the main exception to a generally bright picture in the petrochemical field is the ammonia industry "which is suffering from acute over capacity and for which no expansion is foreseen until some years hence."

NITROFORM

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Eastern Sales Manager

Frank Cannon has been named Eastern regional sales manager of the Owens-Illinois Multiwall Bag Division, succeeding George S. Harvey Sr.

Mr. Cannon, who has ten years' experience in selling multiwall bags, had been Philadelphia sales representative. His headquarters now are in the Chrysler Building in New York.

•

Move Philadelphia Office

The Richardson Scale Company has moved its Philadelphia regional office to 11 Park Road, Havertown, Pa. The office handles all the company's business in Pennsylvania, Virginia, Maryland, and Delaware.

At the same time, the company announced the addition of Alan Farnham to the Philadelphia office staff.

•

Pennsalt Plans Stock Split

Directors of the Pennsalt Chemicals Corp., Philadelphia, have voted to recommend to shareholders a 3 for 1 common stock split and an increase in the authorized common to 10 million shares from the present two million. A special shareholders meeting will be held July 1 to consider both proposals.

•

Bulk Fertilizer Service

The Lewis Yoder Co. and the Kellogg Mills, both of Nampa, Idaho, have formed the Farmers Fertilizer Service, which will deal in the sale and spreading of bulk fertilizers.

The new company will use its own trucks for transporting unsacked fertilizer and then distributing it at the fields or it will sell bulk fertilizer to farmers who wish to haul it in their own trucks.

•

To Buy Seabrook Farms Stock

Seeman Brothers, Inc., New York, a wholesale grocery concern, has contracted to purchase control of Seabrook Farms Co., a major frozen food packer of Seabrook, N. J. Although Seeman plans to continue present Seabrook policies, John M. Seabrook has not yet indicated whether he will remain as president. The sale to Seeman was made by Charles F. Seabrook, chairman of the board.

•

Alabama Seedsmen Meeting

The Alabama Seedsmen's Association will hold its annual convention July 9 and 10 at the Houston Hotel in Dothan, Ala.

•

Fertilizer Price Up $4/Ton

Price for ammonium nitrate fertilizer in the off-season, August-December period, has been raised $4 a ton. The base price for sales in the January-July period will remain unchanged at $68 a ton.

Spencer Chemical Co. announced the price change May 28. Monsanto Chemical Co. and Mississippi River Fuel Corp. indicated they would announce similar price increases.

•

Thompson Buys Plant Site

As the initial step in a major expansion program, Thompson Chemicals Corp., Los Angeles, has purchased a five-acre plant site in St. Louis, Mo. Construction will be started in July.

•

Ernest Back Dies

Dr. Ernest A. Back, a noted entomologist who played a major role in eradicating the citrus fruit fly, died May 21 at Chaplin, Conn. He was 78 years old.

Dr. Back retired in 1947 after 40 years with the Bureau of Entomology of the U. S. Department of Agriculture.

New Book Studies 'Imperfect' Fertilizer Marketing

THE FERTILIZER INDUSTRY by Jesse W. Markham, Prof. Economics. Publishers: The Vanderbilt University Press, Nashville, Tennessee. 249 pages. 1958. $6.00. Reviewed By Vincent Sauchelli.

The author is a professional economist. He is identified with studies about the competitive workability of several industries. This volume which the author subtitles: 'Study of an Imperfect Market," emphasizes that "a vigorous anti-trust policy alone cannot insure workable competition in the fertilizer industry." Further, in an article he published in 1950, he indicated what he means by "workably competitive" in these words: "an industry may be judged to be workably competitive when, after the structural characteristics of its market and dynamic forces that shaped them have been thoroughly examined, there is no clearly indicated change that can be effected through public policy measures that would result in greater social gains than social losses."

This book is directed to thoughtful leaders in government and industry. It is difficult to do justice to its contents and purposes in a brief review. The opinion of this reviewer is that the book deserves the careful study of management and agricultural workers who are entrusted with the responsibility of educating farmers to an appreciation of the values of modern fertilizers in our economy.

The author hits hard at what he considers the practice of farmers to purchase fertilizer unintelligently, that is, "on the price of a per ton of total material, or color, custom or similar irrational criteria." When farmers by using such criteria select high-cost over low cost fertilizers, manufacturers have little incentive to compete on a price basis. The principal obstacle to effective competition in the fertilizer industry, therefore, derives not from its structure nor from collusive agreements . . . but from the highly imperfect knowledge underlying the demand for fertilizers. Hence positive policy rather than anti-trust provides the remedy for the competitive barrier most urgently in need of attention. Until imperfect knowledge is reduced, competition in fertilizer markets where farmers are buyers cannot be effective."

This extended quotation from the book is justified. It somehow reflects the conclusion of other students of the industry.

can you identify this cotton insect by its silhouette?

You have no doubts about this one. It's a boll weevil.

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Diamond Chemicals

CSMA Fly Control Symposium

A symposium on fly control was held at the 45th mid-year meeting of the Chemical Specialties Manufacturers Association in Chicago, May 18 to 20. The symposium was a feature of the CSMA Insecticide Division session and was moderated by Harold L. Haynes, National Carbon Co., Division of Union Carbide Corp., New York.

E. H. Fisher, University of Wisconsin, Madison, reported on fly control for the dairy herd and said that fogging costs about one-half as much as hand spraying of barns and cattle. In Wisconsin, he said, the cost was 67 cents per cow per year for fogging, above the cost of the $10 fogging unit. Hand guns, on the other hand, he said, used 70 cents of insecticide for each cow plus 86 cents of residual insecticide per cow for barn walls and ceilings. In Wisconsin, Dr. Fisher said, they fog 75 to 100 times each year.

Suggestions for the control of flies affecting man and animals were offered by W. C. McDuffie, Entomology Research Division, U.S.D.A., Beltsville, Md., who said that there are no effective means of controlling horse flies and deer flies in their breeding places or after they reach the adult stage. Destroying breeding places through sanitary measures is the first step in the control of house flies and stable flies, he said, and insecticides must be employed to complete the task.

He said that horn flies in beef cattle can be controlled with sprays of methoxychlor, ronnel, malathion, or Co-Ral.

The CSMA's annual household and industrial insecticide survey was reported on by Joseph E. Lee, McLaughlin Gormley King Co., Minneapolis, Minn. In it, it was revealed that sales at manufacturers' level during 1958 totalled almost 10,000,000 gallons of household and industrial insecticides. The total in 1957 was only about 9,000,000.

Of the 1958 figures, livestock sprays accounted for 1,516,347 gallons, up more than 50,000 gallons over 1957. Livestock emulsion concentrate sales totalled 189,198 gallons in 1958, down from the 211,003 gallons sold in 1957.

Stored grain and bin spray sales ammounted to 160,694 gallons in 1958, quite a bit higher than the 91,787 gallons sold in 1957.

More than 120 companies reported data for inclusion in the survey.

•

Is Director of Sales

Dr. P. G. Arvan has been appointed director of sales-agricultural chemicals for the Monsanto Chemical Co.'s Inorganic Chemicals Division at St. Louis, Mo. Dr. Arvan had been director of sales, technical service for that division.

Fertilizer Placement Panel

A panel on fertilizer placement will be a feature of the seventh California Fertilizer Conference, being held June 29 and 30 at the University of California, Davis. Dr. J. E. Knott, chairman of the school's department of vegetable crops, will moderate the panel.

Panel members will be: Dr. Malcolm H. McVickar, California Spray-Chemical Corp., Richmond, Calif.; Dr. O. A. Lorenz, U. of California; Dr. D. S. Mikkelsen, U. of California; Dr. John C. Lingle, U. of California; and Dr. F. J. Hills, U. of California.

Other subjects to be covered at the meeting include tree fruit and vine nutrition, nutrient deficiencies, and fertilizer statistics.

House Committee O.K.'s HR. 6436, Senate To Act Also

From Donald G. Lerch, Jr.

AGREEMENT ruled the day on Capitol Hill when NAC's Executive Secretary Lea Hitchner appeared to testify on a bill to place desiccants, defoliants, plant regulators and nematocides under the Federal Insecticide, Fungicide, and Rodenticide Act.

Mr. Hitchner pointed out that today's agriculture is largely dependent on agricultural chemicals and agricultural chemical research. As new products are developed, he continued, it is desirable that they be regulated in a uniform manner.

If desiccants, defoliants, plant regulators, and nematocides had been in commercial usage in 1947, Mr. Hitchner declared, they no doubt would have been included in the law at that time. He said that enactment of this legislation would set a pattern which would enable the states to adopt similar amendments to their pesticide laws. Many states, he continued, are awaiting the passage of this legislation so that it can be adopted as part of a uniform state legislative program.

As predicted, the bill was noncontroversial. One witness after another testified in favor of the measure. There was Dr. M. R. Clarkson, Deputy Administrator, of USDA's Agricultural Research Service, speaking for USDA; Lea Hitchner for the Industry; A. B. Heagy for the American Pesticide Control Officials; John Datt for the Farm Bureau Federation; Bernard Imming for the Fresh Fruit and Vegetable Association, National Apple Institute, and the International Apple Association.

Support for the bill also came from Dr. H. H. Schwardt, head, Department of Entomology, New York College of Agriculture, and Dr. C. H. Van Middelem, associate biochemist, Florida Agricultural Experiment Stations, speaking for Florida growers as well as for the Experiment Stations. Letters supporting the bill from the National Plant Food Institute, National Cotton Council, California Department of Agriculture, Massachusetts Department of Agriculture, and the U.S. Department of Health, Education and Welfare also went into the record.

Agreement was so complete, Chairman Harold D. Cooley of the House Agriculture Committee, and author of the bill, commented with a chuckle that it isn't often Secretary Benson, the Farm Bureau, and Cooley agree so completely on any farm subject. The bill was reported favorably out of Committee a few minutes after the hearing closed. Prompt passage by the House is expected.

A similar bill has been introduced in the Senate by Sen. Spessard Holland and Sen. George D. Aiken. Action in the Upper Chamber likewise is expected to move ahead smoothly.

The new amendment would make desiccants, defoliants, plant regulators, and nematocides subject to provisions of the Federal Insecticide, Fungicide, and Rodenticide Act and the Miller Pesticide Residue Amendment to the Federal Food, Drug and Cosmetic Act. Effective date of the amendment would be March 5, 1960, or such later date, not beyond March 5, 1961, as the Secretary of Agriculture and the Secretary of Health, Education and Welfare may prescribe. At the request of HEW, these chemicals will remain under the application section of the Food, Drug and Cosmetic Act until the new law does become effective.

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Bagpak Division **INTERNATIONAL PAPER** New York 17, N.Y.

Atherton Joins Hubbard-Hall

The Hubbard-Hall Chemical Co., Waterbury, Conn., has announced the appointment of Raymond P. Atherton, Litchfield County (Conn.) agricultural agent, to its agricultural division as an agricultural economist. The appointment is effective July 1.

Mr. Atherton started his county agent career in 1926 and has been county agricultural agent for Litchfield County since 1929. He will make his headquarters at Hubbard-Hall's general offices in Waterbury.

•

Soils Research Seminar

Nineteen agricultural research workers from 12 colleges participated in a recent soils research seminar, held at the International Minerals & Chemical Corp.'s headquarters at Skokie, Ill., to present reports on projects involving magnesium and potassium in plant growth.

The conference was sponsored by the company's Potash Division and the Research, Engineering, and Development Division. Among the subjects covered were: magnesium research in Michigan, effect of potash sources on potato quality, influence of potassium source on fruit trees, chemistry and physiology of nutrient absorption, and magnesium-potash research.

•

OM Realigns Department

The Olin Mathieson Chemical Corp., New York, has announced a realignment of its Insecticide Products Department. The new program will include the manufacture of Technical DDT, DDT compositions, Technical Terraclor, Terraclor fungicide compositions, Phytomycin (20 per cent Streptomycin solution), BHC Technical, BHC compositions and Omazene fungicide.

K. B. Nash and A. E. Collazo were appointed assistant managers. Mr. Nash, formerly in charge of the insecticide market development program, will be concerned with sales effort and technical sales work. Mr. Collazo, who had been pesticide manager, International Chemicals Division, will handle government insecticide business and matters pertaining to overseas trade. G. D. Baerman is manager of the department.

•

Relocate U.S. Borax Unit

The United States Borax & Chemical Corp., Los Angeles, has announced the relocation of its new product development department at the Anaheim, Calif., laboratories of the company's subsidiary, U. S. Borax Research Corp.

Grover C. Collins has been named manager of the department, which formerly was located in New York.

•

Smith-Douglass To Merge

Directors of Smith-Douglass Co., Norfolk, Va. and Smith Agricultural Chemical Co., Columbus, O., are considering a merger of the two companies. The proposal is subject to approval of shareholders of both concerns, at special meetings to be called within 60 days.

Ecuador Pyrethrum Factory

A small but modern and well-equipped factory for the manufacture of pyrethrum extract has been established in Guapulo, Ecuador, by a recently formed company, Industrial Extractors, S. A.

The plant, which is expected to operate 24 hours a day, seven days a week, will have a daily input of 4,409 pounds of pyrethrum flowers, and an output of 93.7 pounds of extract. Cultivation of pyrethrum flowers began in Ecuador in 1941 and they have been exported commercially since 1953.

•

To Acquire Maywood Works

The Stepan Chemical Co., Chicago, has announced that it has concluded agreements for the acquisition of more than 80 per cent of the voting stock of the Maywood Chemical Works, Maywood, N. J.

Maywood is a producer of lithium, thorium, and rare earth chemicals and owns its mines in South Dakota.

1959 Expected To Be A Big Year For Fertilizer Sales

The 1959 fertilizer year, now underway, is expected to be a boom fertilizer year, according to a report in the May 16 issue of *Chemical Week*. Cited as factors in this prediction are good weather and the economic well-being of farmers.

Last year, the realized gross income of U. S. farmers rose to a record high of nearly $38 billion, an 11 per cent increase over 1957. After deducting farm production expenses, the realized net income showed even stronger gains, reaching $13.1 billion—20 per cent above the 1957 figure. In addition, an increase in farm inventories boosted the total net income to $14.2 billion—22 per cent more than in 1957. This means that there is little, if any, economic hindrance to increased purchase of farm chemicals this year.

Furthermore, preliminary planting intentions of farmers indicated that about nine million additional acres of land would be planted this year. Most of this increase would come out of the soil bank. Corn and cotton will comprise a major portion of the increased acreage.

In the Southeast the volume of fertilizer usage has been 15 to 28 per cent greater than last year. Comparisons are not entirely accurate here, however, because the planting season is about two weeks ahead of normal schedule. Fertilizer consumption for the remainder of the season probably will be less than in the same 1958 period, because of the earlier demand this year. Nevertheless, fertilizer consumption is expected to exceed the volume in 1958 by eight to 12 per cent.

Plantings in some of the Midwest states were delayed last month because of unseasonable weather. However, areas such as Indiana and Ohio show fertilizer tonnage moving well. Also, corn acreages were upped throughout most of the area and most observers believe

that total fertilizer sales in the Midwest will at least equal the 1958 level.

In the West, fertilizer sales were off to an early start this year, with plantings starting around February. Demand during March and April was very heavy but slowed down in May. The outlook was that Western states' consumption would show a substantial increase over 1958 figures.

The overall outlook is for a gain not only in fertilizer tonnage but also in the concentration of plant food/ton of material, which would boost the total use of primary nutrients above 1958 levels also.

•

Bag Facilities Added

New manufacturing equipment has been installed at the Halifax Paper Co. plant at Roanoke Rapids, N. C., which supplies paper for the Raymond Bag Corp.'s production of multiwall bags. Both Raymond and Halifax are divisions of the Albemarle Paper Manufacturing Co., Richmond, Va.

The new equipment is expected to double Halifax kraft paper production.

•

Dedicate Research Center

The new Hooker Chemical Corp. Research Center at Grand Island, N. Y., was dedicated June 2 with ceremonies that were attended by Governor Nelson Rockefeller of New York.

The company's research on chemicals and plastics is conducted at the new center. Also present at the dedication ceremonies were representatives of university chemistry departments and other educators, industrial research personnel, and executives of the chemical and related industries.

•

East African Association

A new trade association has been formed in East Africa for firms engaged in manufacturing and marketing insecticides, fungicides, and herbicides. The group is known as the Pesticide Chemicals Association.

SW Fertilizer Conference and Grade Hearing, July 15

Shown at the planning meeting for the Southwestern Fertilizer Conf. are (left to right): Stanley Hackett, Dixie Fertilizer Co.; Stafford Beaubouf, Grand River Chemical Div., John Deere & Co.; Mrs. Hackett; Dr. J. F. Fudge, Texas State Chemist; James Powledge, National Hotels; Mrs. Fudge; Mrs. Douglas Kelly; Mr. Kelly, Monsanto Chemical Co.; Mrs. N. D. Morgan; and Dr. Morgan, American Potash Institute, Shreveport, Louisiana.

Named To New Post

S. R. Clement, formerly director of sales-agricultural chemicals for the Monsanto Chemical Co.'s Inorganic Chemicals Division, has been appointed to the newly-created position of director of sales in charge of customer relations. His headquarters are in St. Louis.

•

New Mosquito Control Method

The Public Health Service last month reported the discovery of a new method of mosquito control in which household mosquitoes can be killed "without fuss and with little expense" by leaving a bag in insecticide in the room with them.

Government scientists reportedly discovered the method accidentally when they left a closed bag of insecticide overnight in a laboratory where mosquitoes were kept. Experiments indicated that fumes killed the mosquitoes even when the chemicals were put in a plastic lined bag. They found that Malathion and DDVP, used separately or mixed, were the most effective, the report said.

•

North Central ASA To Meet

The North Central branch of the American Society of Agronomy will hold its annual meeting at Kansas State University, June 14 to 17.

Results of recent research by colleges and universities of the North Central area will be presented in 24 scientific papers. In addition, the annual Sweetclover Improvement Conference will be held in conjunction with the meeting.

The Southwestern Fertilizer Conference and Grade Hearing will be held at the Galvez Hotel, Galveston, Texas, July 15 to 18. Among the speakers will be: Dr. Russell Coleman, executive vice president of the National Plant Food Institute; Dr. R. L. Beacher, Southwestern regional manager, NPFI, Fayetteville, Ark.; Ralph Johnson, Georgia Agricultural Extension Service, Athens, Ga.; Dr. J. Q. Lynd, Oklahoma State University, Stillwater; and Jack Timmons, commercial manager of radio station KWKH, Shreveport, La.

Control officials of Arkansas, Louisiana, New Mexico, Oklahoma, and Texas will participate in the annual fertilizer grade hearing to be held on July 17.

Stanley Hackett, Dixie Fertilizer Co., Shreveport, La., will preside over the conference.

•

Davis Joins Raymond Bag

Craig E. Davis has been appointed Project Engineer for the Raymond Bag Corp., Middletown, Ohio.

Mr. Davis previously was a project manager for Ketco, Inc., and had been assistant chief engineer of the Black-Clauson Company at Hamilton, Ohio.

•

Heads Division Sales Office

Eastman Chemical Products, Inc., subsidiary of the Eastman Kodak Co., New York, has named Jesse R. Langston to head its new Chemicals Division sales office in Detroit. Mr. Langston has been with Eastman for six years. His new territory includes Michigan and southwest Ontario, Canada.

INTERNATIONAL'S
FULL ORBIT
SERVICE

Setting New Standards of Customer Service

Your IMC triple super salesmen

bring you

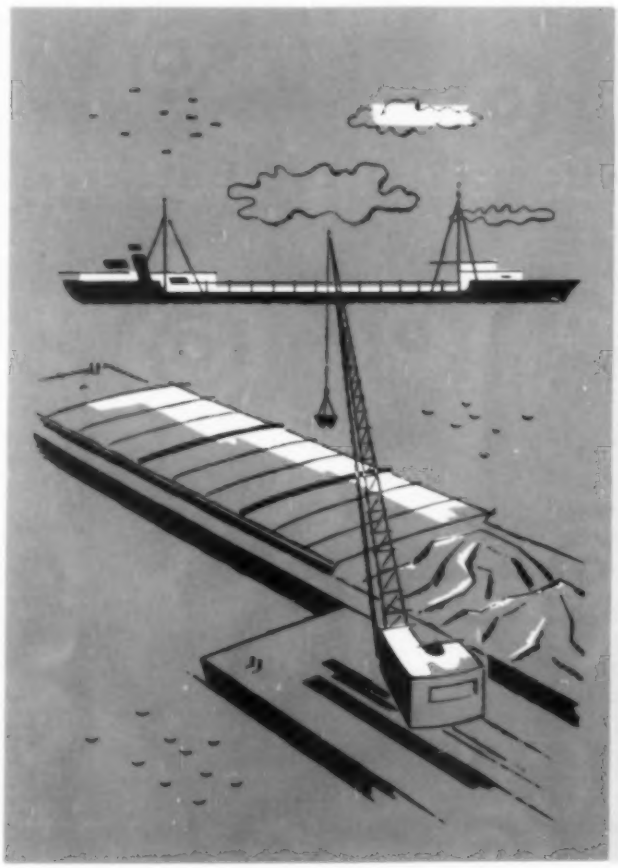
the **BEST**

in **PRODUCT**

and **SERVICE**

Only from International...

triple superphosphate with



IMC transportation service masters the maze of shipping problems for you

Let's face it: delivery can give you skull-busting headaches . . . unless you're protected by International Minerals' General Transportation Service. IMC helps you choose lowest cost methods — ship, barge, rail. IMC offers other advantages, like on-site storage at key transportation centers and rolling warehouse shipments. We can help you with rate negotiations, routing or interpretations of shipping regulations. In short, International Minerals takes the trouble out of triple super shipping.

Triple super trouble shooters -- complete and personalized technical service at your plant

Technical trouble-shooting in the fertilizer business takes experience and personnel. And International Minerals has both — a staff of technicians that stands ready when you need them . . . to help cut your in-plant production problems down to size. Let us help you in formulation . . . choosing equipment . . . designing plant layouts . . . streamlining materials handling . . . or in applying research information. Call on IMC for complete trouble-shooting service that works for you *at no cost to you!*

INTERNATIONAL'S FULL ORBIT SERVICE

triple-value service

From mine to manufacturer, International's quality count-down adds up to superior product control

Nobody guards triple super quality as carefully as International Minerals. Over 40 separate tests are used! More than 400 chemical analyses are made daily. IMC absolutely controls triple quality with a count-down that follows the product from raw material to shipment of the finished product. And as a final quality check, every shipment of International Triple Superphosphate has its own certificate of analysis — mailed to you before material arrives at your plant. Depend on IMC for quality.

FULL ORBIT SERVICE . . . IDEAS AND PLANS TO BUILD VOLUME, PRODUCE MORE PROFIT OVER COSTS!

International Minerals' Full Orbit Service is helping fertilizer manufacturers chart new profit strategy.

It's an exciting and *proved* program that sets new standards of service in the industry. First benefit is IMC's extremely high quality triple superphosphate. Then comes Full Orbit technical help in ironing out your in-plant problems . . . plus help in a host of ways to eliminate your transportation troubles.

Full Orbit Service makes the most of buyer-supplier teamwork to help you solve marketing problems . . . get the most from your sales manpower . . . make sales meetings pay off . . . and get real results from your promotion dollars through professionally planned use of newspapers, radio and TV.

The best part is, International's Full Orbit Service doesn't cost you a cent. Contact your International representative now. There's no obligation. Find out — as many other fertilizer manufacturers have — how IMC's Triple Superphosphate and Full Orbit Service can help you realize extra profits while you benefit from a smoother working operation.

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Producers of Living Minerals

COARSE — International's coarse-textured Triple gives you the same excellent ammoniation batch after batch . . . promotes desirable agglomeration.

GRANULAR—International's granular Triple is non-crumbling, free-flowing, easy to apply—makes this product ideal for direct application.

RUN-OF-PILE—International's even-textured Triple provides uniform particle size, even density and high porosity that lets you ammoniate at higher rates, temperatures.

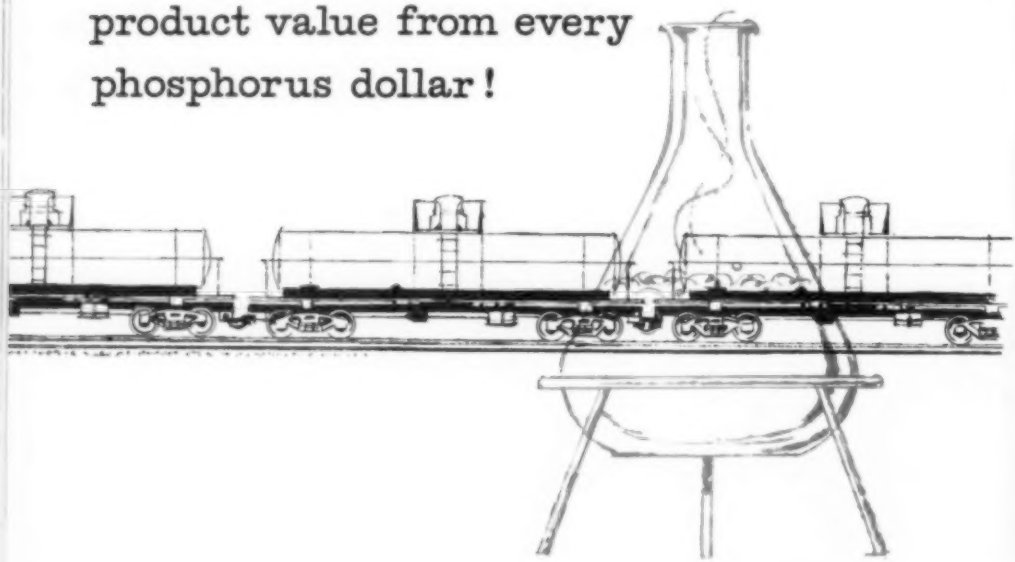
TRIPLE SUPERPHOSPHATE

Available P_2O_5 (min. guarantee) — 46.0%

Particle size:

	R.O.P.	GRANULAR	COARSE
—6 mesh	98-100%	97% min.	97% min.
—65 mesh	22-34%	0.5% max.	4% max.

An International contract helps you get full product value from every phosphorus dollar!



IMC TRIPLE SUPERPHOSPHATES AND PHOSPHATIC FERTILIZER SOLUTION SOLVE FORMULATION PROBLEMS

Now you can make International your dependable single source of all high-analysis phosphate ingredients. Benefit from International's three grades of top-quality triple superphosphate plus high purity 53%-55% phosphatic fertilizer solution. Get all the quality advantages International's processing adds to your product. Be sure with International.

Producers of Living Minerals

MINERALS International CHEMICALS

SPECIAL PRODUCTS DEPT., PHOSPHATE DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois

Pyrethrum Board Advisor

H. Alvin Smith has been named by the Kenya Pyrethrum Board to be an advisor in the United States in connection with sale of pyrethrum, flowers and extract in the United States. Mr. Smith will work with both the Board in Africa and distributors in the U. S. in the maintenance of the Board's direct relationships with processors. His headquarters are at the New Suffolk Marine Corp., New Suffolk, Long Island, N. Y.

•

India Develops Insecticide

A new insecticide, "Citicide", has been developed at the Regional Research Laboratory, Hyderabad, India.

Limited laboratory tests have indicated results which compare favorably with DDT under similar conditions, according to the report. The Indian National Development Corporation is negotiating with firms for the commercial manufacture of Citicide.

•

Dow Study Tour Program

The Dow Chemical Co., Midland, Mich., has announced its sponsorship of a study tour program for county agricultural agents. The program, designed to allow county agents to study agricultural innovations in various parts of the country, is being administered by the National Association of County Agricultural Agents.

The first tour under the program will start in July. Twelve county agents from the North Central States will travel from Benton Harbor, Mich., south to Tennessee, east to North Carolina, north to New York, and back to Michigan by way of southern Ontario.

•

Corn Borer Losses Down

The U. S. Department of Agriculture has reported that more than 100 million bushels of U. S. corn were lost because of European corn borer damage in 1958. This compares with an estimated loss of 180,897,000 bushels in 1957. In only three of the past ten years has borer damage been less costly to corn growers.

•

President of Meyer Firm

Jeffrey W. Meyer last month was named president of Wilson & Geo. Meyer & Co., San Francisco. He succeeds Wilson Meyer, who now is chairman of the board.

Jeffrey Meyer first joined the company in 1948. He is the third generation to be head of the company. Previously, his grandfather, George H. C. Meyer, was president. Wilson Meyer had been president since 1928.

The new president served for three years in the company's Los Angeles office and, following 15 months in the Army during the Korean conflict, he joined the San Francisco headquarters staff, engaging in agricultural sales and serving as vice president of the company.

•

To Operate Phosphate Mine

The J. R. Simplot Co., Pocatello, Idaho, has signed an agreement to manage and operate the beneficiating plant at Conda, Montana.

The change in operation is expected to result in a doubling of the size and scope of the operation, which mined 200,000 tons last year.

Butcher Co. Names Manager

G. LeRoy Hillebert has been named manager, agricultural chemicals for the L. H. Butcher Co., Los Angeles. He has been with the company since 1935.

•

Soil and Crop Meeting

The Soil and Crop Science Society of Florida will hold its 1959 meeting at Gainesville, Fla., Nov. 30 to Dec. 2. The theme of this year's session will be "Twenty Years of Progress in Soil and Crop Research." Included in the meeting will be a symposium on nematology.

•

Add To FMC Laboratory

Construction has begun on a major addition to the Food Machinery and Chemical Corp.'s central chemical research laboratory at Princeton, N. J. The expansion, in the form of a new wing, will add more than 50 per cent to the laboratory floor space.

The recently-formed Inorganic Chemicals Research and Development Department, under the direction of Dr. Hans O. Kauffman, will occupy most of the new wing.

Three Men In Agricultural Chemicals Field On Fatal Flight

Three men whose careers were in the agricultural chemicals field were among the 31 persons killed in the explosion of an air liner near Baltimore, Md., May 12. Among the passengers were C. C. Alexander, head of research for the Agricultural Chemicals Division of the Geigy Chemical Corp., Ardsley, N. Y.; Dr. Leslie G. Boatright, an organic chemist for the Escambia Chemical Corp., New York; and Walter H. Pollard of the St. Regis Paper Co.

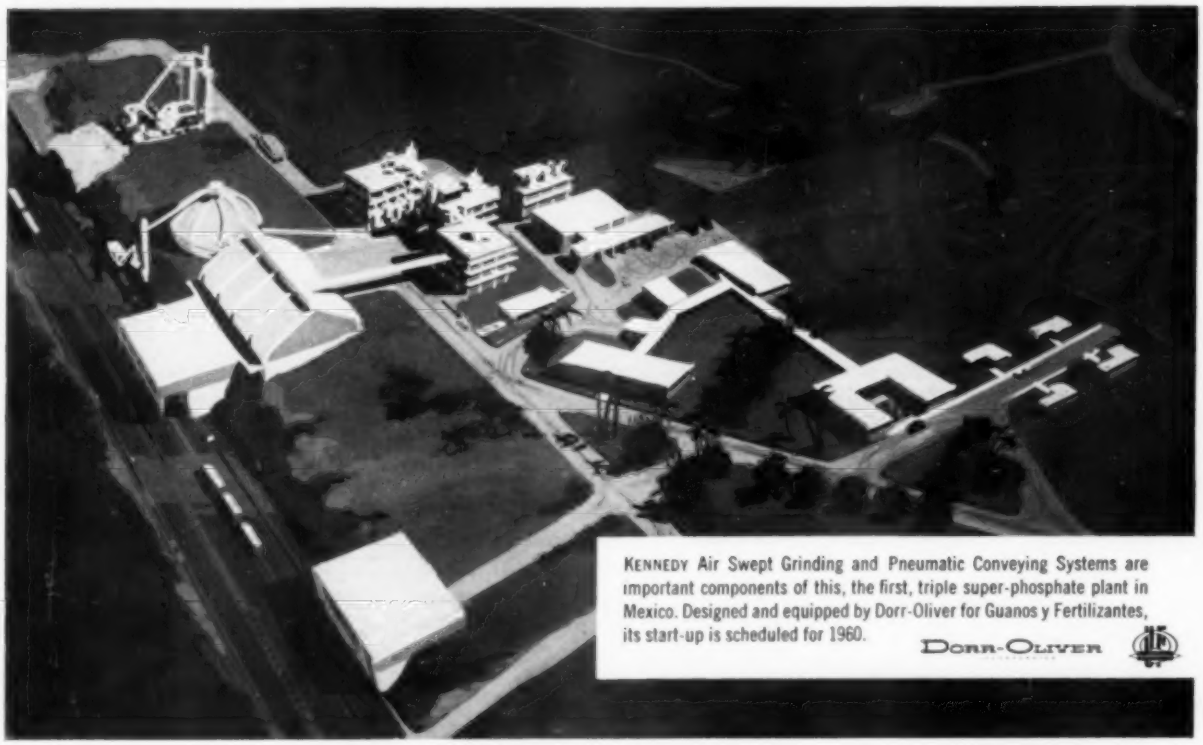
Mr. Alexander, who was 46 years old, was on a trip to Gainesville, Fla. A graduate of Purdue University, with a master's degree from Ohio State University, Mr. Alexander had been with the U. S. Department of Agriculture in Yakima, Wash., before he joined Geigy in 1944. He made his home in Tarrytown, N. Y. Mr. Alexander is survived by his wife, Isobel, and two daughters, Dianne and Patricia.

Dr. Boatright had been with Escambia for four years and previously had been with the American Cyanamid Co. He was graduated from the University of Kansas and received his Ph.D. from Purdue. A resident of Old Greenwich, Conn., he is survived by his wife, Natalie, and a daughter.

Mr. Pollard joined St. Regis in 1957 as consultant and assistant to the executive vice-president. He had been a consulting engineer for various firms during the previous 26 years. He is survived by his wife, Edith, and a son, Walter. He was a resident of Greenwich, Conn.

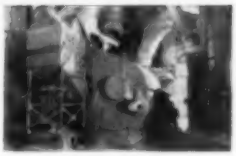
Also listed among the victims of the accident was Dr. Arnold Pensig, a director of research for Chas. Pfizer & Co., Brooklyn.

KENNEDY for grinding & conveying phosphates



KENNEDY Air Swept Grinding and Pneumatic Conveying Systems are important components of this, the first, triple super-phosphate plant in Mexico. Designed and equipped by Dorr-Oliver for Guanos y Fertilizantes, its start-up is scheduled for 1960.

DORR-OLIVER



KENNEDY Ball Mills are noted for high tonnage and low cost processing of phosphate rock and other agricultural chemicals:

- Lowest maintenance cost—cannot be jammed or damaged by tramp iron or other foreign material
- No periodic shut downs for wearing part replacement
- Grinding media is replaced without interruption
- High capacity and product fineness remain constant—month after month
- Careful basic design and pressure lubrication assure high mechanical efficiency
- Reliable feed control and overall reliability provide high production with minimum manpower
- Higher capacity in single units—less space and structural steel per ton of capacity and lower initial investment.

KENNEDY AIR-FLOAT Conveyors provide trouble-free air-gravity conveying of dry materials:

- There are no moving parts—nothing to wear—nothing to maintain
- Only small volumes of low pressure air are needed—uses less power
- Operates quietly—has high capacity—requires little headroom
- The conveyed materials are completely enclosed—there is no dust
- Permits flexible design—directional changes are simple
- Can be made from corrosion resistant alloys
- Eliminates lubrication, complicated gears, belts and chains, spare parts and down time for maintenance.

Consult KENNEDY for further details. Let us show you the many advantages KENNEDY equipment can offer you.

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Alabama Fertilizer Conference

The annual Alabama Fertilizer Conference for members of the fertilizer industry will be held August 18 and 19 at the API Agricultural Experiment Station, Auburn, Ala.

H. T. Rogers head of the agronomy department, reports the program will include tours to observe results of research on lime and fertilizer use at three outlying units of the Experiment Station System: North Alabama Horticulture Substation, Cullman; Tennessee Valley Substation, Belle Mina; and Upper Coastal Plain Substation, Winfield. Also scheduled is a tour of the TVA facilities at Wilson Dam, where research is in progress on new fertilizer materials and manufacturing processes.

In addition to the tours, Experiment Station staff members will report on several aspects of fertilizer use that will be of particular interest to the industry representatives. Included will be such topics as fate of applied nitrogen, factors controlling efficient use of fertilizer, are soil test recommendations adequate for better farmers?, and changes in farm practices.

The fertilizer conference is sponsored by the API Agricultural Experiment Station and Extension Service in cooperation with the Alabama Soil Fertility Society.

•

Johnson Joins Chemagro

F. R. Johnson has been named technical sales representative for the western states by the Chemagro Corp., Kansas City, Mo. His headquarters are at Chemagro's San Mateo, California, office. He formerly was with the Olin Mathieson Chemical Corp.

•

Realign Hooker Sales

The sales organization of the Hooker Chemical Corp.'s Phosphorus Division has been realigned into three sections. Robert B. Boyd is manager, industrial sales; W. Newell Wyatt is manager, sales administration; and Harold E. Frederick, continues as manager, agricultural sales. John B. Sutliffe is division sales manager.

Mr. Frederick was a vice president of the Shea Chemical Corp. when it was merged into Hooker as the Phosphorus Division.

•

Surveys World Conditions

John A. Rodda, manager of Fairfield Chemicals, Food Machinery and Chemical Corp., New York, is shown prior to his departure last month on the first leg of a business trip to the Far East and Europe.

His travels took him to Japan and England, where he surveyed market conditions. Mr. Rodda spoke with government health officials, insect control experts, and manufacturers in the countries which he visited.

•

CAC Meeting Sept. 20-23

The seventh annual meeting and conference of the Canadian Agricultural Chemicals Association will be held Sept. 20-23, at the Chateau Frontenac in Quebec City.

Subjects to be discussed include extension work in agriculture, the use of maleic hydrazide on tobacco crops, the present and future markets in Quebec Province for pesticides, air spraying of forestlands, and the future of corporate farming in Canada.

•

Honor IMC Building

The International Minerals & Chemical Corp.'s new administrative and research center in Skokie, Ill., has received two of the 1959 honors for new buildings.

It was the only office building chosen for a top award in competition sponsored by the Chicago chapter of the American Institute of Architects and it was one of two "merit award" winners in a nation-wide contest sponsored by *Office Management* magazine.

Cowles Appoints Nielsen

A. T. Nielsen has been appointed plant manager of the Cowles Chemical Company's operations at Skaneateles Falls, N. Y. He had been plant manager for the Citro Chemical Co., Maywood, N. J., and transferred to Chas. Pfizer & Co.'s plant at Groton, Conn., when that company purchased Citro in 1948.

•

Agricultural Curriculum at N. C.

North Carolina State College, Raleigh, N. C., is making plans to change its curriculum in the School of Agriculture to meet more adequately industry requirements of its personnel. The college is making a survey of the agricultural chemicals industry, checking on the reaction to the proposed program.

Current plans for the revised curriculum provide courses offering a fundamental training in the main products of the pesticide industry — insecticides, nematocides, fungicides, and herbicides, as well as a review of principles in controlling pests. The main background for such training would be chemistry, botany, zoology, and soils-agronomy, including some classes in the humanities, marketing, salesmanship, and economics.

•

Reorganize TVA Division

The Tennessee Valley Authority's division of chemical development has been reorganized. A fundamental research branch is headed by Dr. Kelly L. Elmore, an applied research branch is headed by Travis P. Hignett, and a process engineering branch is headed by Alvin B. Phillips. The division's design branch is unaffected by the reorganization.

•

Reduce Parathion Time Limit

The U. S. Department of Agriculture has approved the application of parathion to artichokes up to seven days before harvesting. Previously, protection from plume moth and aphid infestation could be maintained only up to fifteen days before harvest.

Phillips *66* Technical Service Men give on-the-job assistance to help solve fertilizer production problems

NEED more effective formulations? What about your ammoniator . . . is it operating efficiently? Do you have a production problem? Then, call in your Phillips *66* Technical Serviceman. He'll be glad to offer you his experience and training—right at your *plant*, for *your* particular problem.

He has behind him all of the Phillips technical know-how, plus the electronic "brains" of Phillips famous Electronic Computer Service—a service that has already saved some fertilizer manufacturers thousands of dollars.

For "inside" information and technical assistance that can mean greater efficiency and increased profits . . . write, wire or call the nearest Phillips sales office.

* * *

Look to Phillips for a dependable source of • Nitrogen Solutions • Anhydrous Ammonia • Ammonium Nitrate • Ammonium Sulfate • Triple Superphosphate

"Good Name Phillips 66 *to Mix With"*

PHILLIPS PETROLEUM COMPANY

Phillips Chemical Company, a subsidiary,

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Control Officials Meeting

The Association of Southern Feed and Fertilizer Control Officials will hold its 17th annual convention at the Velda Rose Motel, Hot Springs, Ark., June 8 to 10.

The first day of the meeting will be taken up by executive sessions and the general sessions will start June 9. Among the speakers will be: J. A. Noone of the National Agricultural Chemicals Association, who will present some observations on the regulation of pesticides; and Dr. Charles Lincoln, U. of Arkansas, who will discuss insect control as affected by resistance and formulation.

Grover C. Dowell, Agricultural Extension Service, Little Rock, Ark., will discuss the pros and cons of fertilizer-insecticide mixtures for the control of soil insects in Arkansas.

•

New Research Center

The Stanford Research Institute, South Pasadena, Calif., has established an agricultural research center under the direction of Dr. Harris M. Benedict, senior plant physiologist of the research organization.

The new center will concentrate its activities on the physical and life sciences, economics, and engineering on a broad spectrum of agricultural problems. The center will carry out research within the institute, and will have limited funds available to sponsor other research by qualified organizations and individuals.

•

Test Fire Ant Venom

Scientists at the Louisiana State University are studying the possible use of fire ant venom as an insecticide, according to Dr. M. S. Blum, LSU entomologist, who said "We haven't found any insect that is completely immune to the fire ant's venom."

As to possibilities in turning the fire ant venom to commercial use as an insecticide, Dr. Blum said that "it doesn't appear to be a compound of a very advanced stature, and it shouldn't be too much of a headache to produce it synthetically."

•

Approve Cyprex For Fruit

The U.S. Department of Agriculture has accepted Cyprex for use on non-bearing cherry trees and as a post-harvest spray on trees bearing fruit. The new fungicide, made by the American Cyanamid Co., New York, is effective for the control of leaf spot. It had been cleared earlier this year for the control of apple and pear scab.

•

Florida Society To Meet

The Florida State Horticultural Society will hold its 72nd annual meeting at the Everglades Hotel in Miami, Oct 27-29.

The society is divided into five sections for the meeting to cover citrus, vegetables, ornamentals, processing, and sub-tropical and comparatively rare fruits. More than 100 papers are expected to be presented by almost 300 authorities on horticulture.

Information regarding registration may be obtained from Dr. Ernest L. Spencer, P.O. Box 2125, Manatee Station, Brandenton, Fla.

30th Rocky Mountain Conf.

The 30th annual meeting of the Rocky Mountain Conference of Entomologists will be held at the Cameron Pass 4-H Club Camp near Gould, Colo., August 9 to 13.

•

Forest Fertilization Report

G. R. Snyder, technical service manager of the agricultural chemicals division of Canadian Industries Ltd., Montreal, predicted last month that the fertilization of Canadian forests may become as common some day as the fertilization of crops.

It has been predicted that the demand on our forests will be doubled in 40 years, he said. Mr. Snyder warned, however, that one-quarter of all forest land is in poorly stocked condition and that more than one-third of all commercial forest land is in medium or poor productivity.

•

Bemis Div. Sales Manager

W. H. Dillon has been named sales manager of the Minneapolis Sales Division of the Bemis Bro. Bag Co., St. Louis. Mr. Dillon had been serving as plant merchandiser at the company's Houston bag factory during the past three years.

Accomplishment Awards To Eleven Monsanto Personnel

Eleven Monsanto Chemical Company research personnel have received the Inorganic Chemicals Division Gaston DuBois Award for research accomplishment during 1958.

The awards were presented by J. L. Christian, Monsanto vice president and division general manager. All of the recipients are members of the division's research department staff. Presented annually, the awards are a divisional honor recognizing members of the research group who have demonstrated unusual initiative and perseverance in scientific accomplishment.

Four of the awards went to individuals; a fifth was presented to a group.

Individual awards went to Melvin C. Thompson for research sales service in agricultural chemicals; Dr. John R. Van Wazer for the authorship of a comprehensive treatise, now published entitled "Phosphorus and Its Compounds"; Dr. Chung Yu Shen for accomplishments in the technology of sodium phosphates, and to Dr. William F. Symes for technical contributions and aggressive leadership in bringing chlorinated cyanuric acids and salts into commercial production.

The group award went to seven scientists for their contributions in the development of Monsanto's process for the manufacture of non-caking, hard prill ammonium nitrate fertilizer. The group included Dr. E. J. Griffith, Dr. J. G. Stites, Dr. R. F. McFarlin, J. E. Lyon, L. E. Frank, C. D. Shallenberger and F. J. LeClair.

Increase of Plant Facilities in Spite of Nitrogen Oversupply Sound Economics in Certain Cases—CMRA Members Advised

GROWTH and sales of industrial chemicals were reviewed by the Chemical Market Research Association at their annual meeting, May 19-21, at the Hotel Plaza, New York City. Chemicals such as nitrogen, agricultural pesticides, borons, surfactants, petrochemicals, plastics, and pharmaceuticals were discussed by industry experts.

In reporting on the petrochemicals industry, Robert L. James, Arthur D. Little, Inc., commented on the ammonia market. "Ammonia cannot maintain its phenomenal growth of 13.4% per year," he stated, "because it has become difficult to convince farmers of the need for large quantities of nitrogen. Much of the land is still unfertilized, and much is still fertilized below optimum levels recognized by agronomists — even so experience in sales during the last 2 or 3 years indicates growth in consumption has slowed down appreciably." Mr. James cited ammonia production figures for 1950 as 3,131 billion pounds . . . in 1957, 7,468 billion pounds. (Dollar value was reported as $133 billion and $300 billion, respectively.)

"Overcapacity is large at the moment . . . 25% more than demand," stated Mr. James. Generally speaking, "Overcapacity can, and has caused declining profits: higher manufacturing costs develop from operating the high unit investment plant at reduced capacity; higher sales expense is necessary to move the products in competitive markets; lower prices are some times resorted to, to help sell the products, and keep additional newcomers out; higher freight equalization costs are frequently necessary to meet new competition."

Commenting on expansion of the industry, Mr. James observed, "In the ammonia industry, location of facilities that were oriented to natural gas in the southwest became somewhat unnecessary. As natural gas became available in many new locations at favorable prices, ammonia plants began to spring up in areas scattered over the country.

"The economics of many of these new plants appeared quite sound, and the facilities could be justified, even though overcapacity on the basis of national demand was almost certain. By operating within a carefully selected market territory, the output of many of the new plants was assured by the saving in freight cost.

"Another factor that has contributed to overcapacity of ammonia (and other industries) is the increasing size of new plants needed to compete with existing plants. Minimum economic ammonia plant sizes have grown from a range of 100 to 125 tons per day, to a range of 150 to 200 tons per day.

"The ammonia business, even with its overcapacity is vulnerable to integration. In today's fertilizer market, only 38% of the fixed nitrogen is sold in mixed fertilizers, and 62% is sold as straight materials, primarily through fertilizer manufacturers acting as sales agents. For some fertilizer companies, whose future is centered largely on maximizing profits in plant nutrients, this trend is being watched closely. One large fertilizer company has announced that it will manufacture ammonia in the near future."

Overcapacity would disappear, of course, observed Mr. James, if no new plants were built before 1964. But additional capacity will probably be added, and in many cases with economic justification for the company involved.

NPFI Program

Also commenting on the nitrogen picture,—George Taylor, Southern Nitrogen Company, cited the work being done by the National Plant Food Institute to increase all fertilizer use by farmers. Merchants, trade magazines and newspapers, and farm group have cooperated in the programs, — and indications are that the program will be quite successful.

Pesticide Picture

H. L. Haller, USDA, Agricultural Research Service, presented a review on pesticides for the market analysts. After reporting on the recent market, Dr. Haller observed that "the extensive use of chemicals today is due largely to the remarkably rapid progress that has been made during the last 15 years in discovery and development of synthetic organic compounds highly toxic to insects, fungi, bacteria, weeds, nematodes, and other pests of crops and livestock.

In the last 15 years, remarked Dr. Haller, about 50,000 new organophosphorous compounds have been synthesized and evaluated for insecticidal properties. About forty of these are now in commercial use, on a world-wide basis, and annual world production is estimated to be about 35 million pounds. Parathion, methyl parathion and malathion account for 85 per cent of the market.

Commenting on the fungicide market, Dr. Haller observed that although rapid progress is being made in development of organic fungicides, — copper sulfate and sulfur are still the fungicide materials most widely used. About 100 million pounds of copper sulfate and 150 million pounds of sulfur are used annually to control fungus diseases. Reliable figures on herbicide use are not available, continued Dr. Haller, but estimates give at least an indication of the magnitude of weedicide use. Sodium chlorate was used in '58 to the extent of 135 million pounds; boron compounds, about 50 million pounds; sodium arsenite, about 4.5 million pounds. 1958 production of 2,4-D and its salts is estimated at 50 million pounds,

(*Continued on Page* 122)

BREVITIES

ROY ROUGHTON, sales representative for the Potash Division of the International Minerals & Chemical Corp., Skokie, Ill., died last month of complications resulting from injuries suffered in an auto accident. The accident occurred April 13, near Milwaukee.

AC

THE MICHIGAN CHEMICAL CORP., St. Louis, Mich., is offering, in commercial quantities, lauryl bromide for use as an intermediate in the preparation of quaternary ammonium salts exhibiting germicidal and algicidal activity.

AC

THE U. S. INDUSTRIAL CHEMICALS Co., New York, has opened a Morea liquid feed premix plant at Tuscola, Ill. It is the second such plant to be put into operation by U.S.I. The first is at Anaheim, Calif.

AC

THE U. S. DEPARTMENT OF AGRICULTURE has cleared Sevin for use on pears and grapes.

AC

DONALD G. SMITH has joined Merck & Co., Chemical Division, as sales representative for plant products. Mr. Smith will work out of Lubbock, Texas, in a territory extending through parts of Texas, New Mexico, Louisiana, and Mississippi.

AC

RED CHINA says it has developed a high-quality nitrogen fixing bacteria fertilizer from burnt coal ashes and maize flour.

AC

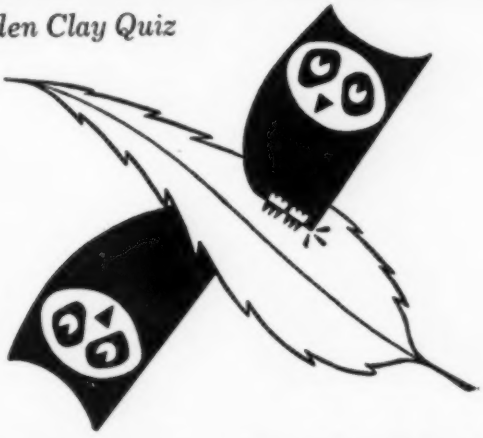
PAUL C. MANGELSDORF, formerly assistant geneticist on the staff of the Connecticut Agricultural Experiment Station and now director of the Botanical Museum at Harvard University, will be one of the speakers at the dedication of the Slate Laboratory of the station, June 9.

FREEMONT MINING and Manufacturing Corp., Riverton, Wyo., a new concern, will produce soil conditioning products, according to Ray L. Atwood, president and treasurer of the firm.

AC

J. R. SIMPLOT CO. has signed an agreement to operate the Anaconda Company's phosphate mines and plant at Conda, Idaho. Last year, the 29-year-old mine produced 200,000 tons of phosphate materials.

Barden Clay Quiz



DO YOUR DUSTS STICK TO THE LEAF?

They do if they contain Barden Clay. Barden sticks through rain or wind. Barden is the industry's kaolin standard for a carrier-diluent in wettables and dusts; for an anti-caking conditioner in prilled fertilizers, and 93-94 percent sulfur.

These Barden features make it superior for all formulations: lowest abrasion...better sticking...high bulking value...greater uniformity...better deposits ...maximum economy...superior wettables.

Working samples on request.

J. M. HUBER CORPORATION
630 Third Ave., New York 17, N. Y.

Wise owls read Huber Technical Data. Ask to be put on our mailing list.

FOR DUST OR SPRAY
USE BARDEN CLAY
The Low-Cost Scientific Diluent

HUBER

Interested in 75% Wettables and Concentrates? Zeolex 7A is the new synthesized carrier for top results. It's versatile, too: serves as a bulking agent, and as a static-free conditioner for 99 percent sulfur grinding. Write for more information.

WONDERWALL™
cuts bag costs up to 20% for Huber Corporation

"In just one of our critical shipping areas, we saved 20% in bag costs by switching to WONDERWALL", states Mr. E. M. Krech, Director of Purchases for J. M. Huber Corporation, Hillside, N. J., the largest producer of Kaolin clay in the United States.

"WONDERWALL bags have demonstrated their strength in resisting breakage under severest transit conditions. We reduce breakage and actually save money by using a WONDERWALL that is 40 pounds lighter in basis weight than our former natural kraft multiwall."

WONDERWALL is West Virginia's new, tougher multiwall that outperforms ordinary bags because it's made with Kraftsman Clupak* paper. It *stretches* and withstands punishment that breaks old-fashioned kraft. WONDERWALLS pack faster, handle easier, stack better —weigh and cost less.

See how the WONDERWALL can cut your bag costs too. Let a West Virginia representative show you. Write or call Multiwall Bag Division, West Virginia Pulp and Paper Company, 230 Park Avenue, New York 17, N. Y.

West Virginia Pulp and Paper

**Clupak, Inc.'s trademark for extensible paper manufactured under its authority.*

Colloidal CP-5 Brochure

The Colloidal Corp., Sausalito, Calif., has prepared a brochure describing CP-5 dust sticker. The product is said to provide an increase in initial deposit of dust on plants and superior weathering characteristics.

•

Union Bag Uniseal System

The Union Bag-Camp Corp., New York, has developed a multiwall paper bag called Uniseal and a special closing machine that combine to produce a heat sealed, liquid and air-tight package.

Designed to hold up to 100 pounds of bulk product, the Uniseal bag is constructed in the form of a tube of from two to six plies of paper, depending on the product to be packaged. The vertical seam and the bottom of the inner ply are heat sealed by the bag manufacturer. The top of the inner ply is, of course, heat sealed by the bag user after the bag is filled. The closing machine then applies adhesive to the tops of the outer plies, which are folded over and pasted.

•

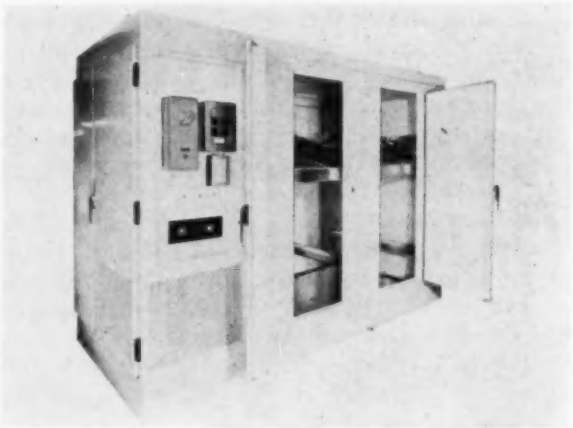
Plastic Lined Steel Pail

The Jones & Laughlin Steel Corp.'s Container Division is offering a seamless, polyethylene plastic lined steel pail, known as the New JaLiner.

The company expects the container to find wide application in packaging and shipping such products as acids and alkalies and insecticides. The liner, which has a minimum wall thickness of 10 mils, is blow-molded of polyethylene. It is attached to the cover of the outer steel container at the pouring opening before it is inserted into the container at the J&L plants at Toledo, Ohio, and Lancaster, Pa.

Equipment, Supplies, Bulletins

Labine Offer Rooms For Soil and Plant Studies



Plant Growth Rooms, manufactured by Labline, Inc., Chicago, are offered as a way to analyze the effects of atmospheric and chemical changes on the growth and propagation of plants. The Plant Growth Room is a specialized type of environmental cabinet that enables scientists to completely control conditions of temperature, light, humidity, and other natural factors pertinent to soil and plant studies.

The rooms are made to individual specifications from bench to floor model sizes and consist of two sections; one for plant growth and one for controls.

Slat-Type Sewing Conveyor

The Minneapolis Sewing Machine Co., Minneapolis, Minn., is offering an adjustable conveyor that features an all-metal, slat-type conveyor belt. In addition, the conveyor and sewing head can be regulated to the correct position for the operator's size and the size of the bag he is closing.

Of all metal construction, the unit, Model LS-100, will sew bags ranging in size from five pounds to 200 pounds capacity. A Model M-100 heavy duty sewing head is standard equipment on the conveyor.

•

Insecticide Recommendations

The 1959 insecticide recommendations of the Entomology Research Division, Agricultural Research Service, for the control of insects attacking crops and livestock, are presented in a 129-page handbook.

The booklet is Agriculture Handbook No. 120, Feb. 1959, and is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. It costs 65 cents per copy.

•

Blue Offers Two Applicators

The John Blue Co., Huntsville, Ala., has introduced an ammonia applicator that has a tank capacity up to 310 gallons, and a liquid chemical spreader that can cover up to 20 acres an hour at rates in excess of 60 gallons per acre.

The ammonia applicator is Blue Nitro-Shooter Series 80. The other applicator, John Blue Series 800 Chemi-Spredder, is offered with a choice of heavy gauge aluminum or steel tanks of capacities up to 300 gallons.

•

Offer Compatibility Chart

The Colloidal Products Corp., Sausalito, Calif., is making available the western fruit growers' "Compatibility Chart of Spray Materials" prepared by Dr. Harold F. Madsen of the U. of California and Dr. Stanley C. Hoyt of the State College of Washington.

The chart is printed on a plastic card and is shirt pocket size.

Seedsmen Discuss Merits of Mixing Seeds and Fertilizer

MEMBERS attending the 27th annual convention of the Florida Seedsmen & Garden Supply Association May 9-11 in Miami, heard Florida Director of Seed Inspection, Milton V. Meadows discuss the growing trend toward mixing fertilizer and seed.

Mr. Meadows said that while this practice is not new to farmers, it has been increasing particularly among companies providing custom mixtures so that the farmer can cover his field with one application.

"We do not have enough information to know how much damage will be done", he said, "but on seed crops we know that there will be damage. Certain chemical fertilizers under humid conditions will burn the seeds. Perhaps if the mixture is put into the field soon after it is mixed, there will be no complaints. But sooner or later, some farmers are going to get bad results."

Chan Baker, a grass seed specialist from Miami, observed that he has found evidence of pregermination of grass seeds due to the increased moisture content of fertilizers under humid conditions.

Outgoing president of the Association, John Bellows, Hector Supply Company, Miami, mentioned the hazards of using the same equipment for different mixtures. "I would hate to think", said Mr. Bellows, "what could happen if we mixed a batch of fertilizer and grass seed for application to a golf course, and then followed with a mixture of fertilizer and crop seeds. Unless the equipment was thoroughly cleaned between runs, the results could be extremely bad."

Stanley Eubanks and Robert Holmes, representatives of the California Spray-Chemical Corporation, showed a series of color slides designed to aid retail seed, feed, and fertilizer stores to do a better job of merchandising.

At the conclusion of the three-day convention, the following officers were elected for the coming year: president Frank P. McMichael, Crenshaw-McMichael Seed Co., Tampa, Fla.; 1st vice-president R. K. Herring, Kilgore Seed Store, West Palm Beach, Fla.; 2nd vice-president Richard L. Carson, Hollywood Farm & Garden Supply, Hollywood, Fla.; and secretary-treasurer David Wurst, Florida Seed & Feed Co., Ocala, Fla.

New officers of the Florida Seedsmen pres. F. P. McMichael, Crenshaw-McMichael Seed Co., Tampa; 1st vice-pres. R. K. Herring, Kilgore Seed Store, West Palm Beach; and 2nd vice-pres. R. L. Carson, Hollywood Farm & Garden Supply.

Milton V. Meadows, Fla. Dept. of Agriculture, speaking at the 27th convention of the Florida Seedsmen.

Gordon Wood (left), manager of Turf & Garden Supply division of Hector Supply Co., Miami; and Nathan Mayo, Supervising Inspector, Inspection Bureau, Fla. Dept. of Agriculture, at the Miami Beach convention.

To Utilize Coal Waste

The Philadelphia and Reading Corp. and the General Dynamics Corp. have announced plans to set up a jointly owned corporation to produce chemicals from anthracite mining waste and residue products. The new company would be known as Dynamics Reading Chemicals, Inc.

Manufacturing facilities would be at Pottsville, Pa. Dynamics Reading would produce hydrogen, ammonia, ammonium nitrate, urea, nitrogen solutions, methanol, calcium carbide, acetylene, and vinyl chloride.

•

Tisdale Addresses Businessmen

"Commercial fertilizers and lime,—properly used, make it possible for the Southern farmer to compete successfully with farmers in any section of the country", observed Dr. Samuel L. Tisdale, southeastern regional director for NPFI, when he addressed the Businessmen's Agricultural Club in Memphis, Tenn. on May 4th. He continued in his comments to say, "Few, if any other industries in this country, can offer their customers a product which will assure them of a return on their investment that equals the return realized from the intellegent use of commercial fertilizer."

Dr. Tisdale cited increased yields in cotton obtained by South Carolina farmers when they dusted, fertilized, and managed the crop as they should. Other data offered at the meeting showed that higher profits and yields through higher fertilizer use have also been obtained on corn, forage crops, hay and pasture crops, in several other southern states.

Concluding his remarks, Dr. Tisdale stated that the southeastern farmer has at his command the essential ingredients for a successful and prosperous operation. Also, that in spite of the returns it nets its users, fertilizer costs have advanced less than the costs of almost any agricultural input.

SOUTHERN FERTILIZER ACTIVITE Co., Edwards, Miss., has been granted a charter of incorporation.

AQUATIC LIFE

(*From Page* 36)

in two of them game-fish reductions of about 70 and 80 per cent were found in certain sections which may have been due to delayed effects of DDT.

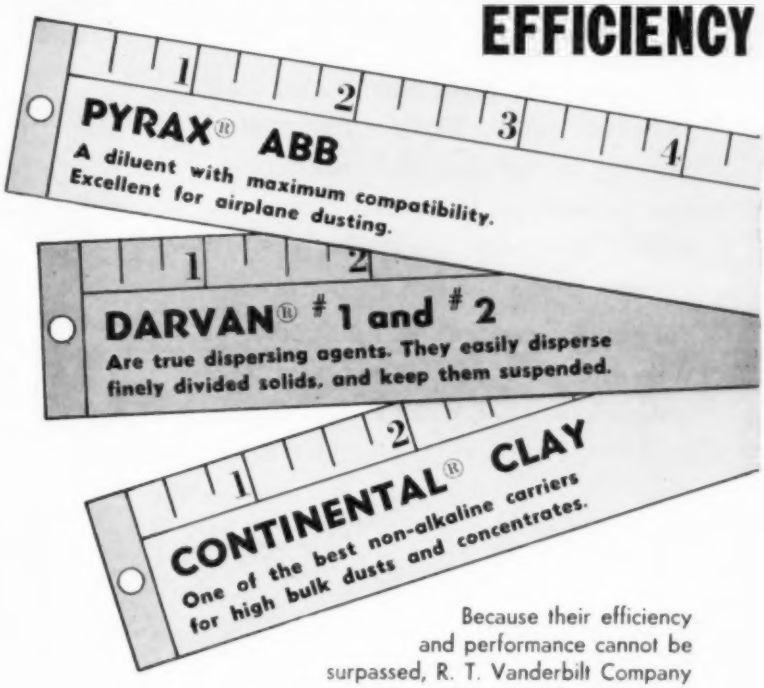
In 1957, I had an opportunity to visit this area and to confer with specialists in the cooperating agencies, and also with others of the zoology and chemistry departments of Montana State College, in regard to setting up an intensive study of the effects of DDT spraying on fish and fish-food organisms in the Ruby River. M. S. Schechter, chemist of our Pesticide Chemicals Research Branch, later joined the group to assist in setting up a laboratory for running DDT analyses. A special effort will be made in this study to determine the amount of DDT in the water, sediment, vegetation, and fish both before and at intervals after spraying; direct and indirect effects of DDT on fish and fish-food organisms; and the reason for greatly delayed mortality of fish if this should occur.

For many years, State and Federal officials in several northeastern states have checked streams in connection with spray programs for evidence of fish mortality, which might be attributable to the one-pound-per-acre dosage of DDT for control of forest insects. Only infrequently have sizeable losses been noted. In 1957, a number of streams were checked routinely in connection with the gypsy moth spray program, and trained workers were unable to substantiate the losses claimed by some individuals and publicized in newspaper and magazine articles.

The effect of DDT on fish and their food received considerable attention in the court case instigated in 1957 by 11 plaintiffs from Long Island, New York, to restrain the Secretary of the U. S. Department of Agriculture and the State Commissioner of Agriculture and Markets from committing trespasses upon their lands by means of low-flying planes and spraying their lands with DDT, and to prevent future aerial spraying of their lands with insecticides. About 50 witnesses testified at this trial, which lasted almost a month and included testimony on the effects of DDT on human health, fish, wildlife, bees, biological control agents, plants, and soil. In his overall decision in favor of the defendants, Judge Bruchhausen (1958) stated:

> The plaintiffs have not sustained their claim that spraying causes any considerable loss of birds, fish, bees, and insects. Only a few fish and birds were killed in the subject area. Furthermore, evidence of spraying programs throughout the country demonstrates that the fish, bird, and bee loss has been inconsequential.

YARDSTICKS FOR FORMULATING EFFICIENCY


PYRAX® ABB
A diluent with maximum compatibility.
Excellent for airplane dusting.
DARVAN® #1 and #2
Are true dispersing agents. They easily disperse
finely divided solids, and keep them suspended.
CONTINENTAL® CLAY
One of the best non-alkaline carriers
for high bulk dusts and concentrates.

Because their efficiency and performance cannot be surpassed, R. T. Vanderbilt Company carriers have become the yardstick against which other products are measured.

Why settle for less, when true economy calls for the best? These diluents and dispersing agents enable toxicants to do a better job. With Vanderbilt carriers your dusts and sprays will cling, cover and kill. Get the full facts today – use this handy coupon.

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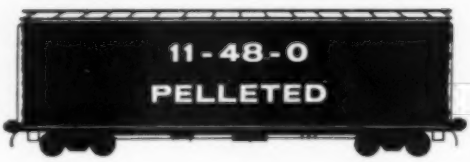
straight or combined loads...
anywhere in the West...

your shipment gets there FAST when you order ANCHOR phosphates!

Your customers get the fast service they like when you order *Anchor* for their phosphate needs. Western Phosphates' centrally located plant at Garfield, Utah, and network of in-transit warehouses assure prompt delivery to Western growers.

For full information, call any office of Wilson & Geo. Meyer & Co., Intermountain, sales agent for these 7 Anchor products. They will expedite your order.



Western Phosphates' plant at Garfield, Utah, is centrally located to serve all the west... fast!

ANCHOR
PELLETED PHOSPHATE FERTILIZERS

Produced by WESTERN PHOSPHATES, INC., Garfield, Utah

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WILSON & GEO. MEYER & CO.
INTERMOUNTAIN
CALIFORNIA: San Francisco, Fresno, Los Angeles, El Centro – ARIZONA: Phoenix – OREGON: Portland – WASHINGTON: Seattle – IDAHO: Twin Falls – COLORADO: Denver – UTAH: Salt Lake City

"While there is no evidence of damage to bees and aquatic insects in the subject area, experts and others from various sections of the country established that the defections are made up by repopulation in a short space of time.

(*Conclusion Next Month*)

ANACONDA CO.

(*From Page 37*)

The drier discharge and crushed oversize from the drier grizzly pass over a belt conveyor to an elevator, which discharges to two duplex screens. The closely sized intermediate screen product is the finished fertilizer product, and is delivered by gravity to a bin, from which it is discharged to storage through an automatic scale and conveying system.

Oversize material from screens goes to a bin which discharges through two vibrating feeders to two pulverizers, one of which is a standby. The pulverized material is delivered to the fines conveyor. In this manner, both the fines and the oversize from the screens are returned to the blunger, and the screen feed remains in circulation except for the quantity of product which goes to storage.

The circulation system has a dust and fume collection system, discharging through cyclones to the scrubbers handling the gases from the drier exhaust system. The cyclone dust is returned to the blunger.

One of the most important process steps in the production of either type of fertilizer is drying. Because of the high circulation rates, detention time in the drier is short, and the slurry layer deposited on the granules must be extremely thin. A concurrent drier is utilized and exit gas temperature is held at the desired drying temperature of 100-110°C for ammonium phosphate and 95-100°C for triple superphosphate. Because of cascading and gas solids mingling, dried product is discharged at approximately the same temperature as the exit gases.

Relatively large quantities of air are used for drying, with the great majority admitted as secondary air at the head end of the drier. Primary air to the burners is regulated to produce optimum combustion conditions.★★

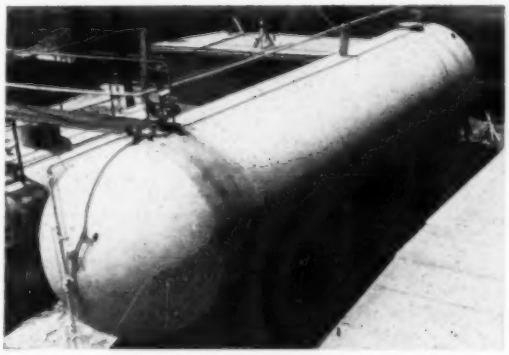
PYRETHRUM

(*From Page 41*)

posit of 0.466 ppm. Such a residue, even if it accumulated in the kernels from repeated applications, would permit 17 such treatments during a single season, without exceeding the legal tolerance of 8 ppm of piperonyl butoxide.

Sacks of grains, beans, peas, copra, cocoa beans and similar commodities may need protection in infested warehouses or holds of ships. A spray containing 3 per cent piperonyl butoxide and 0.3 per cent pyrethrins is applied at the rate of 1 ml. per square foot of the surface or 10 ml. on 10 sq. ft. of sack material. If it is assumed that all of the insecticidal ingredients entered the edible portions of these commodities (based upon 100 lb. of weight), there would be an initial calculated residue of 6.6 ppm, which is well within the tolerance of 8 ppm of piperonyl butoxide.

At canneries, space treatments are often used for control of fruit flies. Sprays containing 10 per cent piperonyl butoxide and 1 per cent pyrethrins in mechanical aerosols are applied at the rate of one ounce per 1000 cu. ft. of space. If we assume that all of the active ingredients of these treatments entered fruits having a diameter of 2½ in., there would be a calculated initial residue of 1.55 ppm piperonyl butoxide. If a contact spray is used that contains 0.1 per cent piperonyl butoxide and 0.01 per cent pyrethrins, at six pints per van load of 4000 lb. of fruits, there would be a calculated initial residue of 1.5 ppm of piperonyl butoxide. For either use, it is inconceivable that repeat treatments



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Elevated Tanks, Pressure Vessels, Chemical and Processing Equipment from Aluminum, Stainless and Carbon Steel, Monel and Other Alloys.

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R. D. COLE MANUFACTURING CO.
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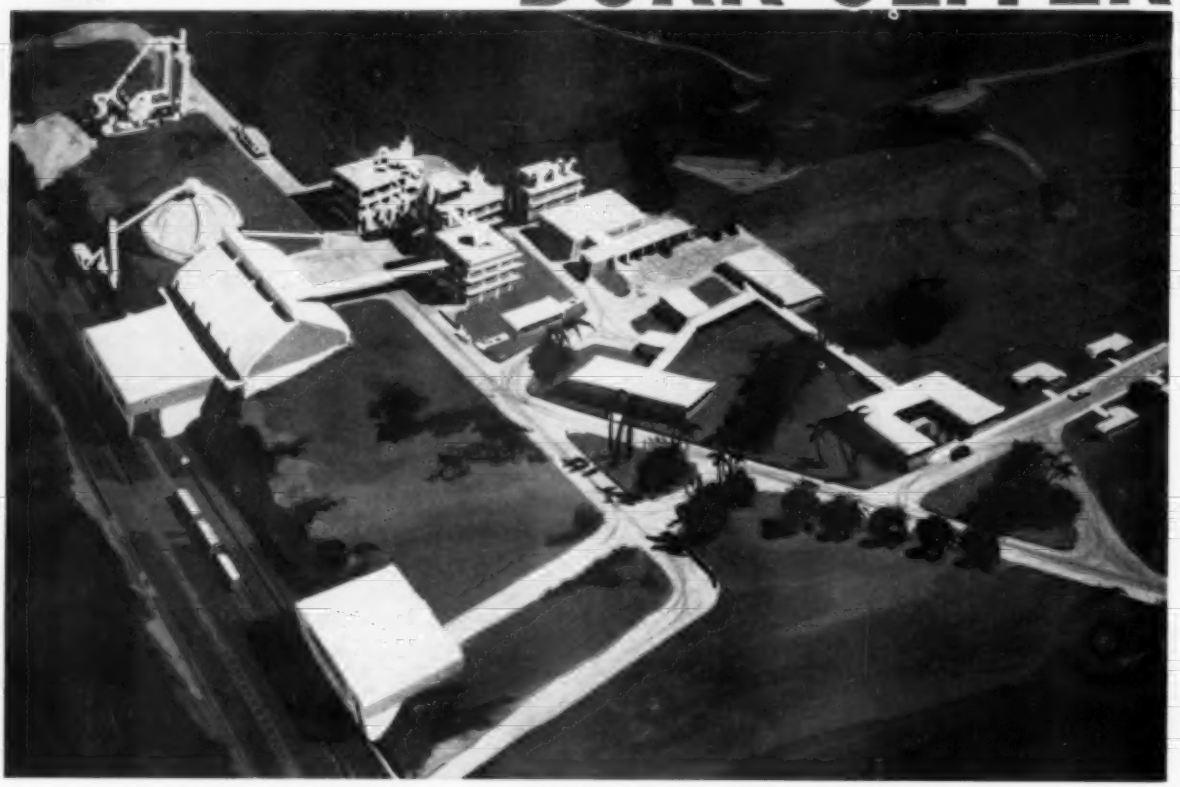

Mexico's first Triple Superphosphate plant

Designed to produce 150 metric tons per day of granular fertilizer, the plant sketched above is part of a Mexican government program to promote agriculture and increase industrial independence. It will be the latest of several chemical and fertilizer operations of Guanos y Fertilizantes de Mexico, S. A., and the first Mexican plant producing triple superphosphates. Start-up is scheduled for 1960.

Like so many of the most modern fertilizer plants erected throughout the world, this new venture will employ the Dorrco Granular Fertilizer and Dorrco Strong Phosphoric Acid Processes. Plant design, engineering and equipment for these processes are being supplied by Dorr-Oliver Inc. The contract with Dorr-Oliver also calls for design, engineering and supply of equipment for the unloading and storage of raw materials, shipping, power production, warehouse and laboratory facilities, and for offices and other buildings.

The services of Dorr-Oliver cover all phases of fertilizer plant design, from laboratory studies and economic evaluation to supplying a complete operating facility of any size. Write for a copy of Bulletin No. 8000 – or let us send an engineer to discuss your particular project. No obligation, of course.

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would exceed the allowed tolerance of 8 ppm.

In the field where fruits and tomatoes are harvested, it is permissible to dip cracked-open tomatoes or injured fruits in a suitable emulsion containing 1 per cent piperonyl butoxide and 0.1 per cent pyrethrins. Tomatoes, pears and fruits of similar sizes would have a calculated initial residue of about 7.5 ppm piperonyl butoxide. This is sufficient to prevent egg laying of fruit flies for about 48 hours or longer. One-half the concentration of the same ingredients is effective for about 24 hours. Again, the calculated initial residues are less than the legal tolerance of 8 ppm.

On fresh copra the use of surface sprays containing three and six times the amounts of active ingredients ordinarily used for surface treatment, gave only 5 and 6 ppm of piperonyl butoxide respectively. The samples were analyzed about two months after treatment. The amount of spray that could adhere to the fresh copra appeared to be the limiting factor on the residues formed. It will be noted that the residues recovered were less than the officially allowed tolerance of 8 ppm.

Official Tolerances

The Food and Drug Administration, Department of Health, Education and Welfare, Washington 25, D. C., published under Title 21—Food and Drugs in the Federal Register, dated March 11, 1955, an order on tolerances and exemptions from tolerances for pesticide chemicals in or on raw agricultural commodies. These were based on findings of fact that were developed at public hearings held in 1950, and did not take into account the research advances made since that time. The order stated, as used in agriculture today, no tolerances need be established for residues of pyrethrins, pyrethrum or piperonyl butoxide (piperonyl cyclonene and rotenone also were included) under Section 406 of the Federal Food, Drug and Cosmetic Act. It added that these materials should be exempt under Section 408 from the requirement of a tolerance when applied to growing crops.

Under Title 21—Food and Drugs—the Food and Drug Administration added two new sections which were made effective upon publication in the Federal Register of February 15, 1956. Sections numbered 120.127 and 120.128 provided for tolerances of 20 ppm for residues of piperonyl butoxide and 3 ppm for residues of pyrethrins following post harvest uses on barley, buckwheat, corn (including popcorn) rice, rye and wheat.

Following other certifications by the U.S. Department of Agriculture on the usefulness of pyrethrins and piperonyl butoxide for post harvest applications, the Food and Drug Administration published an order in the Federal Register, April 9, 1956. This provided a second paragraph to Sections 120.127 and 120.128 and authorized tolerances of eight parts piperonyl butoxide (butyl carbityl) (6-propyl piperonyl ether) and one part pyrethrins from post harvest use in or on the following raw agricultural commodities: almonds, apples, beans, blackberries, blueberries (huckleberries, cherries, cocoa beans, copra, cottonseed, crabapples, currants, dewberries, figs, flaxseed, gooseberries, grain sorghum, grapes, guavas, loganberries, mangoes, muskmelons, oats, oranges, peaches, peanuts, pears, peas, pineapples, plums (fresh prunes), raspberries, tomatoes and walnuts.

The above tolerances and the list of commodities to which they apply represented the first official clearances for post harvest uses of any pesticide in the United States. They show that pyrethrins and piperonyl butoxide fully comply with health standards and the provisions of the new pesticide law 518, sometimes known as the Miller Bill. These tolerances and clearances should be ample as-

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A HIGH GRADE COLLIODAL KAOLINITIC KAOLIN

"TAKO" Airfloated Colloidal Kaolinitic Kaolin is a practically pure inert colloid with exceptional qualities. Used in large tonnage for years most successfully and economically as a prilling and graining agent in the production of fertilizers.

"TAKO" Excellent adhesive-absorption qualities—colloidal properties—excels in formulations of insecticides and pesticides—gives increased workability, dispersion—free flowing from all types of dusting equipment—absolute minimum drifting when sprayed from airplanes—does not reduce toxic action.

MICRON SIZE

Minus 1 Micron...55%
" 2 " ...68%
" 5 " ...85%

No Mica—No Alkalies

Airfloated; Bagged or Bulk Guaranteed less 1% free moisture

"TAKO"—This Natural Very Pure Colloidal Kaolinitic Kaolin is produced from our Company-owned mines, processed with the very latest electric controlled automatic equipment—resulting in our very low per ton established price for this high quality colloidal product.

Non-Abrasive • Non-Hygroscopic • Non-Caking • Free-Flowing

"TAKO" is produced under Complete Laboratory Control, always uniform quality.

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THE THOMAS ALABAMA KAOLIN CO.. 2412 KEN OAK RD., BALTIMORE 9, MARYLAND

surance to producers, handlers and users of grains and other stored products who do not wish to compromise on the health or safety of the consumer.

In the United States there is a zero tolerance for pesticide residues in milk. This means that no residue of a pesticide is tolerated in milk by the Food and Drug Administration. Even though the requirement seems rigid, dairy animals may be sprayed with pyrethrins and piperonyl butoxide for control of flies and other parasites.

Cows sprayed daily for more than four years at the South Carolina Prison Farm with piperonyl butoxide and pyrethrins and right up to the time that samples were obtained, showed no insecticide in either the milk, fat or muscle tissues of the treated animals. Because of these findings the Food and Drug Administration advised the United States Department of Agriculture that it made no exception to the use of these materials on dairy or beef animals. Consequently, labels showing that the active ingredients consist only of pyrethrins and piperonyl butoxide also show rates and recommendations for direct application of sprays to both beef and dairy animals.★★

APPLICATOR PROBLEMS

(*From Page* 59)

eration. Most of us have good safety records. The ag-aviation business, as a whole, has a much better safety record than most people realize. When figures are available for a sufficient length of time from over the nation, our good safety record will begin to show. NATA is in the best position to compile and analyze these figures. Careful study of this information should make it possible for us to improve our safety record even more.

We need a greater public relations effort. We need it badly. Every industry must sell itself. We have made little effort beyond local advertising. I don't think that the chemical manufacturers, the bankers, the government agencies or the general public fully realize the large percentage of total agricultural chemicals that are applied by airplane; that many airplane companies provide expert field service and are called upon to recommend the proper chemical, make the application and then stand behind the results; that in many cases the airplane is the only way a chemical may be applied to save a crop from destruction; that the airplane has played a major part in the tremendous increase in per acre yields of many crops; the scope of the rangeland and forestry work being done exclusively by airplane; and the number of airplanes and small airplane companies with ability and integrity that serve almost every farming community and provide a necessary service. People must be told. Figures must be compiled

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MgO 40.39

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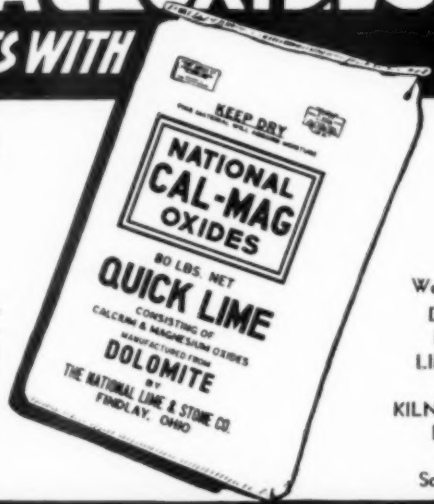
Unexcelled for its superior Dehydrating, Neutralizing, and Curing factors in the preparation of better fertilizers. Write for complete information.

PROMPT SHIPMENTS

Three railroads serve our Carey, Ohio plant—assuring prompt delivery—everywhere.



We Also Produce
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and
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and made public. Again, this is a job for our national organization, NATA.

These are only a few of the problems and jobs. *All* of them represent dollars ($$) to your business and affect your operation. All of them affect your ability to keep your business strong and healthy and to continue to provide a service to the grower and your community. All of us must work together to help solve these problems.

The Agricultural Division of National Aviation Trades Association is being run *by* and *for* the aerial applicator. It is the *only* national association which is representing agricultural aviation interests. NATA needs your ideas and support. For our own good let's give them a hand.★★

EMULSION SPRAYS

(*From Page* 61)

are poured together. Some stirring is desirable. The diesel oil should be free from resins or rust. Add the 2,4,5-T diesel oil mixture to the water while it is circulating or being mechanically agitated. Water should be cleaned and relatively low in carbonates and sulfates. Water that will form a lather with ordinary hand soap may be used in preparing a good spray emulsion. Circulation of the mixture should be continued until it is a uniform whitish color. If the spray emulsion stands for several hours without being used, it should be thoroughly stirred until the whitish color is formed throughout. The spray emulsion should not be prepared or stored in a rusty container. Generally, emulsion sprays should be applied immediately after preparation. The mixing man should have a thorough knowledge of the procedures necessary for making and maintaining a good emulsion spray.

Low-volatile 2,4,5-T ester emulsion sprays, applied so as to produce good foliage coverage, have given satisfactory control of oak brush in research tests each year since 1952. Maximum effectiveness was obtained with 2,4,5-T emulsion spray applied when the plants were in full leaf and growing actively. The most consistent results were obtained from applications made when the air temperature was 50 to 70 degrees Farhenheit, the wind velocity 5 miles per hour or less, and soil moisture sufficient for good plant growth. Deferred grazing during the growing season while treatments were being made has been necessary for maximum grass recovery and oak suppression.

Invert-Emulsion Sprays

In mixing invert emulsions, it is essential that the water be added slowly under constant mechanical agitation to the 2,4,5-T ester-diesel oil mixture. Mechanical stirring was the only satisfactory method for preparing invert emulsions. In applying the thick invert emulsion spray, special equipment would be required. This spray also should be used immediately after being prepared.★★

CHEMICAL DESICCATION

(*From Page* 63)

a few hours in the case of trefoil to a week with alfalfa.

Certain precautions must be observed by the spray applicator and his equipment should possess certain characteristics. Flagmen should be used at all times to avoid misses. Applications are best made in the early morning while air turbulence is lowest. At this time, the danger of drift to adjacent crops is kept at a minimum. The applicator should use equipment which will deliver maximum size droplets for better penetration into the foliage mass and reduction of drift hazard. All check valves should be quick closing and functioning properly so there will be no spray trails following shut-off. Distance between swaths should be low enough to insure complete coverage. Best results are obtained when temperatures climb following the application.★★

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★ *Uniform* — Ground in a continuous mill and then treated in an air separator to remove oversize particles, 92 to 95% of the resulting product will pass a 325 mesh screen. Average particle size is below 5 microns. Weight, 32 lbs. per cu. ft. Because of its favorable physical characteristics and uniformity it forms homogeneous mixtures with pesticides and will not, like some other diluents, settle out from the active ingredients upon standing.

★ *Superior Adhering Properties* — Because it is difficult to wet, Glendon's Insecticide Grade Pyrophyllite clings firmly to plant leaves even through heavy rains.

★ *Superior for Aerial Application* — When used as a carrier in dusts for aerial application, Glendon's Insecticide Grade Pyrophyllite has been demonstrated to settle more quickly than other diluents, thus minimizing the hazards of drift, waste of toxicant and failure to hit target areas.

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SUPER FLO PROCESS

(*From Page 47*)

It is understood the Super Flo process may also be used for manufacturing enriched or triple superphosphates and is available in sizes ranging upward from 10 tons per hour.★★

PEST ROUND UP

(*From Page 73*)

hoppers averaged 0.5 per square foot, but were not of economic importance in Kiowa County. Heavy hatches occurred in Kings County, California, adjacent to several thousand acres of vegetables and cotton. Hatching was also underway in Beaver, Washington and Kane Counties, Utah.

Other Insect Activity

Aphids affecting fruit were hatching as far north as Massachusetts by late April. Populations were light in Maryland and Delaware and normal or below in northern Virginia apple orchards. Insects were light to heavy on peach trees in areas of New Mexico, hatching on apples in Washington and abundant on neglected apple orchards in Idaho.

Mites were heavy in a few Florida citrus groves and medium on navel oranges in the Carmichael, California, area. States reporting mites as hatching by mid-April or later included Oregon, Idaho, Utah, New Mexico, Ohio, Indiana, Virginia, Maryland and Pennsylvania. Oviposition was reported from the Carbondale, Illinois area.

Truck crop insect activity was relatively light during April. Some heavy aphid populations were reported from Fresno County, California, on sugar beets and from Maricopa County, Arizona, on papago peas. Cabbage in southeastern Virginia was generally infested, as was spinach and lettuce. Greenhouse radishes and tomatoes in Lancaster County, Pennsylvania, carried abundant populations of the green peach aphid. This aphid had presented a control problem on greenhouse tomatoes in Mifflin County, Pa., for some time.

Cotton insect activity during April was very limited. Whiteflies, darkling beetles and cotton aphids, all light, were reported from Arizona, and bollworms from the Calipatria area of Imperial County, California. Cotton aphids required limited control in the Texas Rio Grande Valley area. Cutworms, false chinch bugs and bollworms caused limited damage in the same area. Fleahopper activity increased in the valley, and boll weevils were found in a few fields south of San Juan and Alamo where cotton was beginning to square.

European Chafer Found in Brooklyn

The European chafer, a serious turf pest, was identified from Brooklyn, New York, in March of this year. Until this find, the known infestations of this insect were in western New York, and a small area in south central Connecticut. An isolated infestation was found in eastern West Virginia several years ago, but following insecticide application no specimens have since been found. The extent of the Brooklyn infestation is not known, but a preliminary survey showed damaged turf and chafer infestations over an area 6 miles long and approximately 1½ miles wide, starting near the entrance of the Brooklyn–Battery Tunnel and extending eastward along the south shore on both sides of the Belt Parkway. A delimiting survey is continuing.★★

PRODUCTION COSTS

(*From Page 55*)

The continuous ammoniator-granulator cannot be materially varied in size to fit different rates of production. A minimum size is dictated by the necessity to handle a bed of material in proper physical condition and at the same time achieve ammoniation, mixing, and

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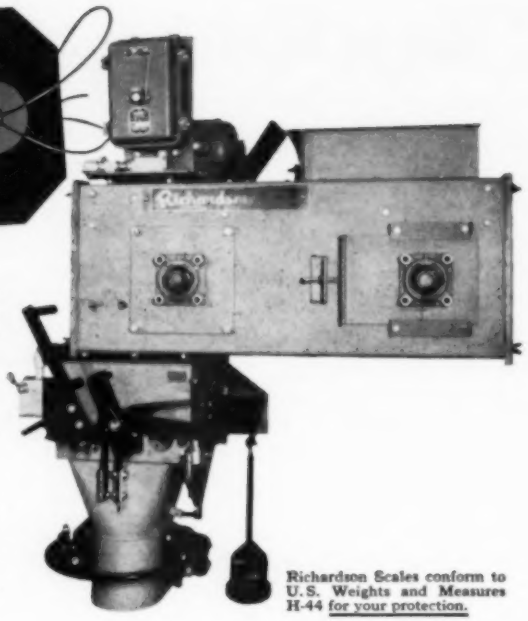

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granular formation. Yet it is a rare case in today's granulation experience where this minimum sized vessel is too small for most production rates.

It is possible that bottlenecks appear in most plants before the production capacity of the granulator has been reached.

So the top capacity of ammoniator-granulators may be somewhat unknown. Because granulation is still an art and depends upon operator control, an upper limit in production may be inherent to these physical limitations.

Raw materials should be crushed to pass a 10 mesh screen if a 6 mesh top screen is used for finished product. A screen which can handle 40 tons per hour using 5 mesh will have less capacity when changed to 10 mesh. Generally speaking, however, raw material screens have not been undersized, and their size can be varied directly for any production rate desired.

The use of steam in granulating plants is increasing for the production of grades which require auxiliary heat in liquid phase. The size of the steam plant is a direct function of the production rate desired. It can be calculated on the basis of 135 to 150 pounds of steam per ton of production, transplanted to boiler horsepower.

Overall, one or two precautions should be noted by future plant designers. First, define the grade before specifying the capacity of the plant. A guaranteed performance of 20 tons per hour means nothing unless the grade has been named and its formula specified. But, of more importance, don't overlook the reduction of the quality or the increase in formula costs which may be a part of increasing production rates or decreasing the plant's cost.★★

STEAM IN GRANULATION

(*From Page* 51)

As to equipment, our installations consist of package boilers, sized so that we have about 50 H.P. per 10 ton of plant capacity, which incidentally seems to be adequate without excessive overdesign. Steam is introduced in a pipe in the same manner as solution and acid, below the rolling bed. Avoidance of blow-thru is necessary and is accomplished by injecting the steam toward the ammoniator shell at from 40 to 60 PSIG.

Factors Causing Failures with Steam

Probably the biggest reason for not getting good results would be not getting enough steam into the bed to do what is being attempted. Even with adequate boiler capacity, if pipe line restrictions or something of that nature keep steam from getting to the bed, the results, of course, are unfavorable. In addition, there must be enough soluble salts to form good pellets and enough free moisture to dissolve the soluble salts, just as where steam is not used. In this respect, it has been noted that in some grades, it is impossible to remove all acid and maintain well formed, hard pellets regardless of moisture and temperature in the ammoniator.

Batch vs Continuous Production

Specific details of the circumstances prompting the question of a batch vs a continuous production system might have considerable bearing on the answer. If starting from scratch to build a granulating plant, initial cost of equipment would probably be the same for batching as for a continuous operation.

The advantages of formulation flexibility, recycle handling, control and ease of operation which continuous systems have over the batching operation makes the continuous much more desirable, in my estimation. Tonnage rates required would also influence such a decision, 20- or 30-ton per hour plants would be more economical to run as continuous plants than as batch plants.

The thing to keep in mind, I should think, is that the ammoniation equipment is all that is in question, since the same equipment would be used from this point on in either case.★★

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FERTILIZER VIEWS

(*From Page* 83)

flated yield. The organic-only advocates would have one believe that fertilizers provide only parts of the whole. Perhaps . . . but, as previously stated, those parts are the particularly deficient nutrients in cultivated soils.

Orthodox agricultural science is willing to concede the value of organic matter in the soil as a factor in promoting crop growth. It is not willing to concede – at least not on any evidence yet adduced from the Haughley experiment or elsewhere – that NPK fertilizers can be dispensed with in modern farming practices. Assuming, for example, that at least one per cent of organic matter is needed in a soil, this means having at least 20,000 pounds per acre in the upper 6 inches of soil. The only economical, practical method of providing this necessary amount is to grow it as a fertilized, grass-legume cover crop and turning it under. Intensive farming practices demanding a high level of fertility will produce a thick residue of roots and crop debris which contribute substantially to the maintenance of soil organic matter. Commercial fertilizers applied in amounts sufficient to correct soil deficiencies for maximum acre yields plus sound soil management practices give sustained, profitable crop yields.

Hence, the slogan, organic farming with chemicals.★★

EDITORIAL

(*Continued from Page* 33)

remember the depredations of the alfalfa weevil and the spittle bug last season, and seem to be convinced that on alfalfa they must either treat with a pesticide or not raise a crop. The perennial story in the insecticide business has always been that the seasons of biggest pesticide use follow by a year the seasons of the biggest infestations. Most farmers are convinced this year that they need some chemical assistance.

Perhaps the major exception to the general picture of expanding sales is benzene hexachloride. On this product volume has been dropping steadily, but the newer pesticides are selling at a rapid enough rate to much more than make up for the lost sales volume. On pesticides for foliar application, we will have to wait until infestations develop as the season progresses, but it is becoming increasingly apparent that, if June and July are moist and warm, this could well be the biggest insecticide year in history.

CMRA MEETING

(*From Page* 106)

and 2,4,5-T at 5 million pounds.

In connection with the market for fumigants,–Dr. Haller remarked that the largest use is for insect control in stored grain. Soil fumigating chemicals were originally used to control soil-inhabiting insects, and are still used in sizable quantities for this purpose . . . The greater potential use, however, is for control of root rotting organisms, nematodes, and weed seeds. As widely recognized, however, cost is probably the greatest limiting factor at the present in the use of soil fumigants on field crops.

An interesting set of data offered by Dr. Haller included a table of farm production expenditures for pesticides for 1955. The figures showed that of a total expenditure of $232 million, $59 M was spent for cotton pesticides; $25 M on field crops; $32 M on fruit and nut crops; and $32 M on cash grains. This data is taken from Farmers' Expenditures, Vol. III, Special Reports II, U. S. Census of Agriculture, 1954.

Miscellaneous:

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PESTICIDE TESTING

(*From Page* 40)

are based also on a fifty foot row, with the treatment being applied in the furrow, or on the surface of a strip three feet wide. Surface applications are worked into the soil or remain on the surface as desired. In the case of nematocide studies, it appears to be better to use larger rectangular plots. Seed treatment plots can be placed three to a row fifty feet long, or a 16 ft. row section planted to 100 seeds.

Where statistical treatment of the data may be required, the treatments should occur on replicated plots. For early screening trials, replication may not be necessary, but in determining effective dosages by means of yield data, it certainly becomes necessary to replicate. We generally use three or four replicates in spray trials, and in soil treatments. For seed treatment trials, we sometimes use as many as six replicates. Replication tends to equalize variations in the data from causes other than the experimental procedure. Equally important, for statistical reasons, is the randomization of the plots within each replicate (block). We use a serial arrangement of the plots in the first replicate (assuming it is one of the possible random plans); but randomize the plots in the remaining blocks. The reason for not randomizing the first replicate is to have dosage effects observable in adjacent rows in at least one replicate. Placing all replicates (blocks) in one tier has proven to be time saving and better in all mechanical procedures. Tests for different companies are not intermingled, but form separate experiments.

Standard treatments and checks (non-treated plots) should be included in all experimental set-ups. The checks reveal the extent or severity of the disease or insect problem; and the standards give a comparison between a known material and the experimental product. To base decisions on trials

without checks or standards, for reasons of economy, is very risky. A clean plot not compared with a check could mean the absence of disease, or it could mean complete control. A diseased plot not compared with a standard might unjustly condemn a material, which under the circumstances could be as effective as the missing standard.

All equipment for handling applications on single row plots is designed and built to order in local machine shops. We use a self-propelled single row spray rig for most foliar and some soil treatment work. The spray pump is operated by a separate motor. Various pressures and nozzle arrangements can be used for specific purposes. For some foliar treatments where the height or spread of the rows is too great, we use a hose extension from the spray rig and spray mannually. For the seed and soil treatment plots, we have built a piece of equipment for accurately lining out the rows. It levels the soil, opens, and covers the furrow, and rolls the soil after planting. We have not yet mechanized the application of nematocides on small plots. This operation must be done with hand injection equipment, or otherwise distributed manually.

Chemical samples submitted for testing should be coded, as it is not necessary that the composition of a material be known to obtain a successful trial. Separate samples should be supplied for each application that is required. These samples should be weighed or measured for the quantity needed to mix a batch to cover the number of replicates in the trial. The exact amounts are determined by dosages per 100 gallons or pounds per acre. In most cases, these samples need not be larger than 50 grams or 100 cc. The number of applications required may be as few as just one treatment (e.g. soil treatments), or as high as 15 in the case of a tomato fungicide trial.

Timing of applications is very important in fungicide trials. For most diseases under average conditions, a seven day schedule is adequate. Some disease on the better treatments and the standard is desirable to properly evaluate a material. We are interested in the breaking points rather than in perfect control while testing fungicides. Should we find an experimental material with a rating better than a standard having some disease, then we can feel more assurance that the material is really very good. There are times, however, when fungus diseases become so active, that a seven day schedule of application is not enough. The schedule then may be reduced to four or five days.

The type of data obtained varies with the crop and the purpose of the test. In fungicide trials, the plots are scored several times as the disease develops, and yields are taken. In some cases, the quality of the crop is recorded also.

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Data from soil fungicide and seed treatment trials usually are in the form of counts of emerged seedlings and subsequent plant losses or root damage. In some insecticide trials, counts of the insect population before and after treatment are used, whereas in others, insect damage to the crop may be the record needed. Herbicide trials are scored for weed population and the predominate weeds identified. Root examinations are used to score nematocide plots for the severity of root knot infection. Kodachrome photographic slides are used where pictures of the plots will be of benefit.

Since the objective for field trials is to test materials under conditions of use and to hasten their development, representatives of the clients are always welcome to visit the trials for observation of their experiments. We also try to keep clients posted on developments as they occur by brief preliminary reports. At the conclusion of the trials, and usually within two weeks, a full report is prepared for the client showing the results of his experiment. Experimental data are not published and remain the property of the client to use as he wishes.

A final statement on the scheduling of trials is important to all concerned. The proper management of field trials is essentially a system of logistics—i.e. having the right material, in the right amount, at the right place, and at the right time. Should there be any failure in this logistical sequence, the success of the trial is endangered. It sometimes is hard for research and development personnel at a distance and busy with other problems to realize that we begin planning for a new season as soon as the current season is over. Planning for the best use of land, equipment, and time is started in June and July. Most of the allocations for the fall trials should be completed by September 20, and similarly for the spring season by January 20. Adherence to the schedules permits the maximum use of the facilities and reduces the danger of overloading the trials with experiments accepted too late.★★

NITROGEN EFFECTS

(*From Page* 55)

in corn leaf tissues than ammonium nitrate (33-0-0).

The application of either 40 or 80 pounds of nitrogen per acre with any of the five types of straight nitrogen fertilizer resulted in increased nitrogen content of corn leaves on all soil types tested. These increases were highly significant on the Barnes, Hanska, Webster and Harpstad Hammerly soil types.

The nitrogen composition of corn grain is often considered to be a rough measure of the feeding value of the corn for ruminants. Analysis of the nitrogen concentration of corn grain grown when fertilized with one of the five types of straight nitrogen fertilizer is shown in Table 3. The values shown may be converted to those of total crude protein by using the factor of 6.25.

On the Barnes loam, the application of ammonium nitrate (33-0-0), urea (45-0-0), and Uran (28-0-0), each produced corn grain significantly higher in total nitrogen than did either the application of anhydrous ammonia (82-0-0), or Nitrana (41-0-0) nitrogen. In addition, both ammonium nitrate and urea produced corn grain significantly higher in total nitrogen composition than did the application of Uran. There were no significant increases in the nitrogen concentrations in the corn grain where grown on the Barnes loam or the Hanska sandy loam due to fertilizer type.

Highly significant increases in nitrogen composition of corn grain occurred on the fields tested when all types of straight nitrogen fertilizer were applied at either the 40 or the 80 pound rate of application.

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In general these one year results indicate that the application of all types of commonly available straight nitrogen fertilizers to typical soils in West Central Minnesota results in:

1. Higher corn yields.
2. Increased total crude protein content of corn stalks, which means corn silage of higher quality for cattle or sheep.
3. Higher total crude protein content of corn grain, which could result in faster growing and fattening of cattle and sheep on less corn.★★

Table 2. Nitrogen content of 1958 corn ear leaves (at bloom) following nitrogen fertilizer at two rates of application on five different soil types in West Central Minnesota.

Treatment	Soil Type: Barnes loam	Clarion clay loam	Hanska sandy loam	Webster silty clay loam	Harpstad Hammerly silty clay loam
	Percent nitrogen in corn leaves[a]				
33-0-0	2.53	2.58	2.35*	2.48	2.33
45-0-0	2.56	2.52	2.29	2.63	2.26
82-0-0	2.48	2.64	2.17	2.57	2.27
41-0-0	2.33	2.67	2.32*	2.58	2.27
28-0-0	2.45	2.62	2.17	2.73**	2.14
80# Nitrogen/acre	2.57	2.63	2.35	2.68	2.37
40# Nitrogen/acre	2.37	2.58	2.12	2.52	2.13
Check	1.19	2.20	1.64	2.23	1.78
Difference 0-80# N/A.	1.38***	.43	.71**	.45***	.59***
Difference 0-40# N/A.	1.18***	.38	.48**	.29***	.35***
Difference 40-80# N/A.	.20***	.05	.23***	.16***	.24***

[a]Replicate averages.
* Significant at 10% (F.90) level.
** Significant at 5% (F.95) level.
*** Significant at 1% (F.99) level.

Table 3. Nitrogen content of 1958 corn grain following nitrogen fertilization at two rates of application on three soil types in West Central Minnesota.

Treatment	Soil Types: Barnes loam	Hanska sandy loam	Webster silty clay loam
	Percent nitrogen in corn grain[a]		
33-0-0	1.63**	1.57	1.51
45-0-0	1.64**	1.68	1.54
82-0-0	1.48	1.53	1.54
41-0-0	1.48	1.61	1.50
28-0-0	1.56**	1.55	1.48
80# Nitrogen/acre	1.62	1.66	1.60
40# Nitrogen/acre	1.49	1.52	1.43
Check	1.46	1.36	1.24
Difference 0-80# N/A.	.16***	.30**	.36***
Difference 0-40# N/A.	.03	.14**	.19***
Difference 40-80# N/A.	.13***	.16**	.17***

[a]Replicate averages.
** Significant at 5% (F.93) level.
*** Significant at 1% (F.99) level.

Reader's Digest Article Deplores Aerial Spraying

ANOTHER scare article designed to stir up public opinion against aerial spray programs appears in the June, 1959, issue of *The Reader's Digest*, under the title "Backfire in the War Against Insects." Unlike most of the contents of this publication which normally condenses outstanding articles which have already appeared in other publications, this contribution was authored by a member of *RD's* own staff, Robert S. Strother, who is listed as a "roving editor." Just what Mr. Strother's technical training may be, or his qualifications to write on an entomological subject, we are currently checking with the *RD* editorial office, and will report what we find in a later issue.

Little effort was made by Mr. Strother in his article to be objective or impartial, or to present both sides of the controversy. While he observes in his introduction that the need for the spray programs is both hotly challenged and hotly defended, he confines himself largely to a summary of testimony hostile to such control measures. For example, in reporting on the court case which grew out of the aerial spray program against gypsy moth in and around New York in 1957, Mr. Strother comments that "commuters awaiting their trains were sprayed, as were dairy farms, ponds, vegetable gardens and children, some of them three times." He concludes his coverage of this incident with the observation that a request by 14 organic enthusiasts for an injunction to end the spraying was denied, completely ignoring the fact that a suit subsequently brought by the 14 complainants was decided against them on every point at issue by Judge Walter Bruchhausen in Federal Court.

Just to restate the record, Judge Bruchhausen asserted that the plaintiffs had presented no evidence that they or anyone else had been made ill by the spray, and commented that some of the plaintiffs were "so strongly in favor of organic farming — that their judgment may be influenced by their leanings." The court found that only a few fish and birds were killed in the treated area, and evidence of spray programs throughout the country demonstrates that fish, bird and bee loss has been inconsequential. In addition, Judge Bruchhausen observed that, based on the evidence presented in the trial, bird losses are made up by repopulation in a short period.

All these pertinent matters of record *The Reader's Digest's* roving reporter chose to ignore.

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NABAC - 25

(*From Page 53*)

No sign of injury either to fruit or leaves was observed at any time during the tests.

The peach tests were conducted at the farm of Clay Shaw in Stewartstown, Pa. Nabac alone or Nabac plus agrimycin reduced brown rot by about two-thirds as compared with no treatment. However Captan was definitely indi-

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	Dosage Rate	Total Damp-off	Total Good Plants	Average % Damp-off	Average % Good Plants	Average % Come-up
1 Nabac 25	3/4#/100	48	492	6.85	70.3	77.15
2 & 9 Checks		109	335	15.6	47.7	63.3
7 Thylate	2#/100	108	322	15.5	46.3	61.8
8 Fixed Copper	4#/100	82	454	11.7	65.0	76.7
10 Zineb	2#/100	96	422	13.7	50.5	74.2
12 Agr. 500	5#/100	60	414	8.6	59.0	67.6

cated to be the most effective fungicide on brown rot. Nabac sprays starting July 23rd reduced bacterial spot fruit infection over one-third, and leaf infection over one-half. Nabac sprayed peaches apparently ripened a few days earlier. In storage tests, Nabac appeared to give an additive effect to control of brown rot offered by Captan.★★

FLORIDA MEETING

(*From Page* 81)

for control of nematodes, fungi, weeds and bacteria, but that it requires expensive equipment.

Howard Van Pelt, State Plant Board inspector from Winter Park, Florida, described the hot water method of treating bare root plants. He said that it is essential for the plant roots to be completely free of soil in order for this method to be effective. However, if properly done, the hot water method was said to give one hundred percent nematode control, whereas other methods do not.

In connection with the hot water treatment, Mr. Van Pelt said the plants should first be hardened by holding back water and fertilizer. He said that a ten minute dip in water at 122° is effective, and added that careful handling after treatment is important to prevent re-contamination from equipment, containers, or soil. More water and if possible more shade were recommended to help the plants become re-established after hot water treatment.

The Short Course was sponsored through the cooperation of Florida Agricultural Extension Service, Sub-Tropical Experiment Stations, Dade County Agricultural Agents, and the Florida Nurserymen & Growers Association.

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TALE ENDS

OVER a thousand top executives in the fertilizer industry will gather this month at the Greenbrier, White Sulphur Springs, W. Va., where the National Plant Food Institute will hold its fourth annual meeting. Theme of the convention this year is "Fertilization in the Future."

And, as the weary porter pries us out of our bunk, and we ride red-eyed up to the Greenbrier lobby for that cup of cheerful greeting, we will get that old feeling, "Home again, any of you characters got a cigarette?"

AC

The problem of getting new pesticides tested by experiment stations is an old one. With the hundreds of new products being introduced, and the limited personnel and testing facilities available, the stations are in a position to select which products they will work on. Which ones do they choose? In most cases, we feel sure, the ones that seem to them to offer the most promise, but they would be less than human if they were not sometimes influenced by what the developer seems disposed to offer in the way of assistance to the station in one form or another. So, if you want your product tested, you play ball.

AC

The stock holdings of Allied Chemical in Virginia-Carolina Chemical Corp. were the subject of inquiry at Allied's recent annual meeting. A stockholder queried Glen B. Miller, Allied's president, as to why the company continued to hold 43,502 shares of V-C preferred stock. Mr. Miller replied that the stock was acquired before his tenure in office began, but that if V-C does as well as its management hopes to in the future, the stock "ought to be worth more than it is now selling at."

AC

In past years tobacco buyers in the Connecticut area insisted that growers use at least a portion of nitrogen derived from organic sources in fertilizing their acreage. Studies recently completed at the Connecticut Agricultural Experiment Station, however, indicated that there was no difference either in yield or quality which could be traced to the source of the N applied. More on this in a later issue.

AC

Those pesticide formulators who have been dilatory in getting their labels approved have learned to regret it. The word we get is that there is a back log of labels still awaiting OK in USDA offices at Washington, while the late filers gnash their teeth, thinking of all the early season business they are missing.

AC

Cheesecake finds its way into the staid and respectable fertilizer business. Nutrilite Products, Inc., Buena Park, Calif., uses the publicity shot below to call attention to its new "500" liquid fertilizer. It's said to contain organic fish concentrate, chelated trace minerals, an acidifier, and a penetrant. Just what the model contributes to the product other than eye appeal is not made quite clear.

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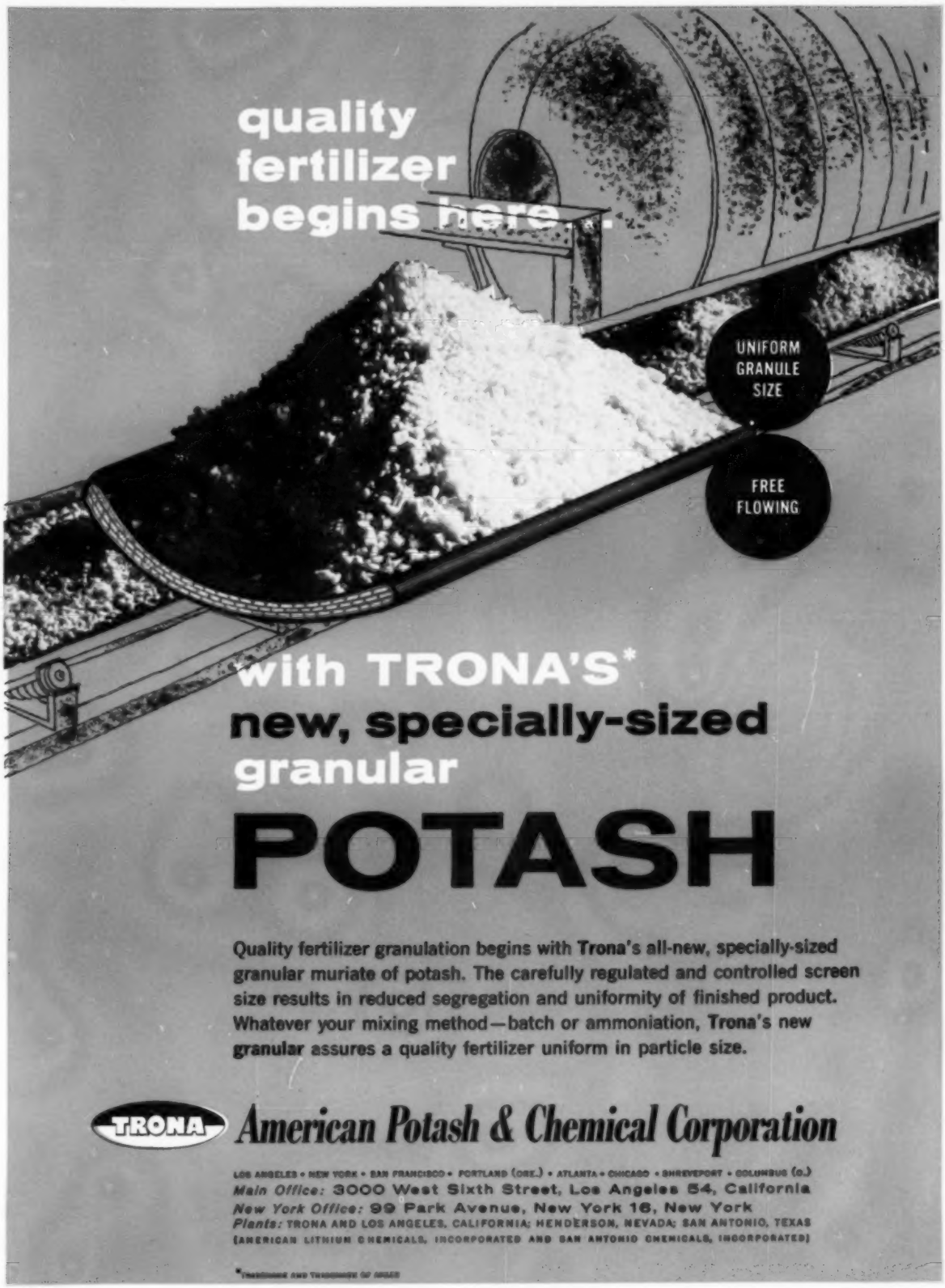

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